

Puerco Collaborative Forest Landscape Restoration Project Environmental Assessment

**Mount Taylor Ranger District, Cibola National Forest and
National Grasslands, Cibola and McKinley Counties, New
Mexico**



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List of Acronyms and Abbreviations

ALRMP	Amended Cibola National Forest Land and Resources Management Plan
BA	Basal Area (ft ² per acre)
BMP(s)	Best Management Practice(s)
BR-E	Basin and Range East Ecological Recovery Unit (ERU)
CBD	Crown Bulk Density
CEQ	Council on Environmental Quality
CI	Crowning Index
CFR	Code of Federal Regulations
DBH	Diameter at Breast Height
DMR	Dwarf Mistletoe Rating
DRC	Diameter at Root Collar
EA	Environmental Assessment
EPA	Environmental Protection Agency
FM	Fuel Model
FRCC	Fire Regime Condition Class
FONSI	Finding of No Significant Impact
HUC	Hydrologic Unit Code
MIS	Management Indicator Species
MSO	Mexican Spotted Owl
NEPA	National Environmental Policy Agency
NF&NG	National Forest and National Grasslands
PAC	Protected Activity Center (MSO)
PFA	Post-fledging Family Area
QMD	Quadratic Mean Diameter
SHPO	State Historic Preservation Officer
RU	Recovery Unit (MSO)
SMZ	Streamside Management Zones
LRMP	1985 Cibola National Forest Land and Resources Management Plan
TPA	Trees per acre
USFS	U.S. Forest Service
USGS	United States Geological Service
VSS	Vegetative Structural Stage
WUI	Wildland Urban Interface

Table of Contents

1	Purpose of and Need for Action.....	1
1.1	Proposed Action	1
1.2	Background.....	2
1.3	Purpose of and Need for Action	4
1.4	Existing Conditions	7
	Vegetation.....	7
	Wildlife.....	10
	Recreation and Scenery Management	10
	Soil/Watershed.....	11
	Water Resource Features and Wetland/Riparian.....	11
	Heritage and Cultural resources.....	12
	Range Management	12
	Transportation.....	12
1.5	Desired Conditions	13
	Vegetation.....	13
	Fuels and Fire Behavior.....	20
	Wildlife.....	21
	Recreation and Scenery Management	21
	Soil/Watershed.....	22
	Water Resource Features and Wetland/Riparian.....	22
	Heritage and Cultural Resources	23
	Range Management	23
	Transportation.....	24
1.6	Decision Framework	24
1.7	Public Involvement.....	24
1.8	Issues	26
2	Alternatives	28
2.1	Alternative A – No Action	28
2.2	Alternative B – The Proposed Action	28
	Plan Amendments.....	34
	Vegetation Treatments.....	35
	Mixed Conifer Treatments	35
	Ponderosa Pine Treatments.....	36
	Mixed Ponderosa Pine & Pinyon-Juniper Transition Treatments.....	39
	Areas Over 40% Slope.....	41
2.3	Design Criteria Common to Action Alternatives	52
	Vegetation Restoration	52
	Scenic and Recreation Resources	52
	Trail Mitigations (within the McGaffey CE Decision) rolled into the Puerco Project.....	54
	Road, Skid Trail and Landing Construction	56
	Fire Control Lines.....	56
	Watershed Resources	56
	Heritage and Cultural Resources	57
	Fire/Fuels	58

Puerco Collaborative Forest Landscape Restoration Project

Wildlife	58
Range Management	59
Transportation	59
Monitoring	60
2.4 New Mexico Forest Restoration Principles	60
2.5 Comparison of Alternatives	66
3 Environmental Consequences	67
3.1 Vegetation	67
Affected Environment	67
Old Growth	68
Northern Goshawk Habitat	71
Mexican Spotted Owl Habitat	73
Environmental Consequences	75
Alternative A – No Action	75
Alternative B	77
Cumulative Effects	81
3.2 Fuels and Fire Behavior	82
Affected Environment	82
Pinyon-Juniper Woodland Type	84
Ponderosa Pine Forest Type	85
Mixed Conifer Forest Type	86
Fire Regime Condition Class	86
Fire Regime	87
Environmental Consequences	89
Alternative A – No Action	91
Alternative B	92
Effects Common to Both Alternatives	94
Cumulative Effects	94
Air Resources	95
Climate and Climate Change	98
Impact of Climate Change on Fire Frequency and Severity	100
3.3 Soil	101
Affected Environment	101
Environmental Consequences	105
Alternative A – No Action	106
Alternative B	107
Vegetation Treatments	107
Road and Unauthorized Route Treatments	109
Watershed Improvements	109
Cumulative Effects	111
3.4 Water Resources	112
Affected Environment	112
Streams	114
Springs	115
Water Quality	115
Riparian	116

Environmental Consequences.....	116
Alternative A – No Action	118
Alternative B	120
Vegetative Treatments.....	120
Riparian, Spring, and Stream Restoration	121
Cumulative Effects	121
3.5 Wildlife.....	122
Affected Environment	122
Terrestrial Wildlife, Fish and Rare Plant	122
Affected Habitat	124
Mexican Spotted Owl	124
Life History.....	124
Habitat Requirements	124
PACs/Core Areas	125
Recovery Habitat	125
Other forest and woodland types	125
Regional & Local Distribution	126
Threats	127
Zuni Fleabane	128
Habitat Requirements	128
Regional & Local Distribution	128
Threats	129
Zuni Bluehead Sucker	130
Habitat Requirements	130
Regional & Local Distribution	131
Threats	132
Southwestern Willow Flycatcher	133
Mexican Wolf.....	133
Life History.....	133
Habitat Requirements	134
Regional & Local Distribution	134
Threats	134
Sensitive Species	135
Spotted Bat.....	135
Gunnison’s prairie dog.....	136
Pale Townsend’s big-eared bat	136
Northern Goshawk.....	137
Northern leopard frog	137
American peregrine falcon.....	138
Villous groundcover milkvetch.....	138
Sivinski’s fleabane	138
Zuni milkvetch.....	139
Arizona leatherflower Clustered leatherflower.....	139
Chaco milkvetch	139
Management Indicator Species.....	139
Rocky Mountain Elk.....	144

Puerco Collaborative Forest Landscape Restoration Project

Mule Deer	144
Juniper titmouse.....	145
Black Bear	145
Pygmy nuthatch	145
Hairy woodpecker	146
Merriam’s Turkey.....	146
Red-naped Sapsucker	146
House Wren	147
Migratory Birds.....	147
Important Bird Areas	151
Over-wintering Areas	151
Environmental Consequences.....	151
Mexican Spotted Owl.....	151
Alternative A – No Action	151
Alternative B	152
Effects to MSO Critical Habitat	162
Cumulative Effects	169
EFFECTS DETERMINATIONS	169
BIOLOGICAL OPINION CONCLUSIONS	169
INCIDENTAL TAKE STATEMENT	170
Zuni Flea Bane	174
No Action	174
Alternative B	175
CUMULATIVE EFFECTS	178
EFFECTS DETERMINATION	178
Zuni Bluehead Sucker & Zuni Bluehead Sucker Critical Habitat	178
No Action	178
Alternative B	178
EFFECTS TO ZUNI BLUEHEAD SUCKER CRITICAL HABITAT	181
CUMULATIVE EFFECTS	187
EFFECTS DETERMINATIONS	188
Southwestern Willow Flycatcher	188
No Action	188
Alternative B	188
Mexican Wolf.....	189
No Action	189
Alternative B	189
CUMULATIVE EFFECTS	191
EFFECTS DETERMINATION	191
Sensitive Species.....	191
Spotted Bat	191
No Action.....	191
Alternative B	192
Gunnison’s prairie dog	192
No Action.....	192
Alternative B	193

Puerco Collaborative Forest Landscape Restoration Project

Pale Townsend's big-eared bat.....	194
No Action.....	194
Alternative B.....	194
Northern Goshawk.....	195
No Action.....	195
Alternative B.....	195
Northern leopard frog.....	196
No Action.....	196
Alternative B.....	197
Villous groundcover milkvetch.....	198
No Action.....	198
Alternative B.....	198
Sivinski's fleabane.....	199
No Action.....	199
Alternative B.....	199
Zuni milkvetch.....	200
No Action.....	200
Alternative B.....	201
Arizona leatherflower Clustered leatherflower.....	201
No Action.....	201
Alternative B.....	202
Chaco milkvetch.....	203
No Action.....	203
Alternative B.....	203
Migratory Birds and MIS.....	204
Cumulative Effects for all species discussed above.....	205
Alternative A.....	205
Alternative B.....	206
3.6 Recreation Resources.....	206
Affected Environment.....	206
Environmental Consequences.....	209
Alternative A – No Action.....	209
Alternative B.....	209
Cumulative Effects.....	210
3.7 Scenic Resources.....	211
Affected Environment.....	211
Landscape Visibility.....	212
Existing Landscape Character.....	213
Valued Landscape Attributes.....	213
Slopes.....	213
Vegetation.....	213
Riparian.....	214
Past Visual Impacts.....	214
Environmental Consequences.....	214
Alternative A – No Action.....	215
Alternative B.....	216

Puerco Collaborative Forest Landscape Restoration Project

Mechanical Treatment	216
Hand thinning	217
Fuelwood Removal.....	217
Prescribed Fire Treatment	218
Initial Burn	218
Pile burn	218
Maintenance burn.....	219
Roads and Improvements	219
High Viewpoints.....	219
Aspen, Meadow, and Spring Restoration	219
Conclusion.....	220
Cumulative Effects.....	220
Timber Harvesting Activities	220
Road Maintenance	221
Recreation.....	221
Forest Plan Revision and Update to Scenery Management System.....	221
3.8 Transportation.....	222
Affected Environment	222
Environmental Consequences.....	225
Alternative A.....	225
Alternative B	225
Cumulative Effects	227
3.9 Heritage Resources	228
Tribal Consultation	228
Affected Environment	229
Environmental Consequences.....	230
Alternative A: No Action Alternative	231
Alternative B: Proposed Action Alternative	231
Mechanical and Manual Vegetation Treatments:	231
Prescribed Fire:.....	232
Cumulative Effects	232
3.10 Range Management	233
Affected Environment	233
Prewitt/6A Allotment.....	233
Wingate Allotment.....	234
Brannon Allotment.....	234
Stinking Springs Allotment.....	235
Berger Allotment.....	235
Cottonwood/Las Tucas Allotment	236
Dent/Dan Valley Allotment	236
Dan Off Allotment	237
Environmental Consequences.....	237
Alternative A - No Action.....	238
Alternative B – Proposed Action	239
Prewitt/6A Allotment:	239
Wingate Allotment:	240

Brennon Allotment:	241
Stinking Springs Allotment:	241
Berger Allotment:	242
Dent/Dan Valley Allotment:	242
Cottonwood/Las Tuces Allotment:	243
Dan Off:	243
Cumulative Effects	243
3.11 Socioeconomics	244
Affected Environment	244
Environmental Justice	244
Economic Conditions and Trends:	245
Environmental Consequences	245
Alternative A – No Action	245
Alternative B	245
Environmental Justice	245
Economic Impacts	246
4 Consultation and Coordination	247
Interdisciplinary Team Members	247
Federal, State, and Local Agencies	247
Tribes	247
Congressional/Others	248
5 Literature Cited	249
Appendix A: Forest Plan Amendments	259
Alternative 2 (Proposed Action) – Cibola National Forest Site-Specific Nonsignificant Forest Plan Amendments	260
Amendment 1. Mexican Spotted Owl Habitat Management	260
Consistency with the Revised Mexican spotted owl Recovery Plan	266
Significance Evaluation	267
Amendment 2. Management of Canopy Cover and Ponderosa Pine with an Open Reference Condition within Goshawk Habitat (Cibola NF)	271
Background	271
Amendment Description	273
Significance Evaluation	277
Appendix B: Zuni Mountain CFLR Old Tree Retention Guidelines	281
Guidelines for Retention of Pre-settlement (Mature and Old) Ponderosa Pine:	281
Additional Characteristics to Consider for Wildlife Tree Retention and Safety:	282
Appendix C: Transportation System Maps	285
Appendix D: Best Management Practices	291
Riparian/Stream Protection BMP	291
Upland related BMPs	299
Appendix E: Response to Comments on the Draft Environmental Assessment	301

List of Tables

Table 1.2.1. Puerco Management Areas.....	2
Table 1.4.1. Acres of Existing Vegetation.....	7
Table 1.4.2. Average Existing Forest Conditions.....	8
Table 1.4.3. Road Miles by Maintenance Level.	12
Table 1.5.1. Acres of Desired Vegetation.....	13
Table 2.2.1. Proposed Activities by Soil Condition and Erosion Hazard	31
Table 2.2.2. Acres of Proposed Mechanical Treatments and Prescribed Fire by Cover Type	32
Table 2.2.3. Proposed Vegetation Treatments and Treatment Types.....	42
Table 2.2.4. Potential Haul Routes.....	48
Table 2.5.1. Comparison of Alternatives	66
Table 3.1.1. Average Existing Forest Conditions.....	67
Table 3.1.2. Old Growth Allocation within the Zuni Mountain CFLRP EMA.....	70
Table 3.1.3. Old Growth Allocation within the Zuni Mountain CFLRP Ecosystem Management Area plus National Forest System lands west of the hogback and CFLRP footprint	70
Table 3.1.4. Old Growth Allocation within the Puerco Collaborative Landscape Restoration Project	70
Table 3.1.5. Vegetative Structural Stage Analysis – One Scale below EMA (Puerco Project Area)	72
Table 3.1.6. Vegetative Structural Stage Analysis – EMA Scale & One Scale Above	72
Table 3.1.7. Average Existing Conditions in Mexican Spotted Owl Habitat.....	73
Table 3.1.8. Puerco Forest Conditions – No Action 30 Years Later	75
Table 3.1.9. Puerco Forest Conditions – 30 Years Post Treatment	78
Table 3.1.10. List of Past Timber Harvest & Related Actions occurring within the Puerco Analysis Area, 1987-present	81
Table 3.1.11. Past Wildfire and Prescribed Burns, Within the Puerco Analysis Area, 1987-present	81
Table 3.1.12. List of Present Actions Occurring Within the Puerco Analysis Area.....	82
Table 3.2.1. Fire Regimes and Existing Condition Class	88
Table 3.2.2. Fire Attributes Under 3 Weather Scenarios.....	89
Table 3.2.3. Ponderosa Pine, FM TL8	91
Table 3.2.4. Pinyon-Juniper, FM 6.....	92
Table 3.2.5. Ponderosa Pine, TL 4	93
Table 3.2.6. Pinyon-Juniper, FM 8.....	94
Table 3.2.7. Vegetation Type and Acres of Prescribed Fire	96
Table 3.3.1. TE Units in the Puerco Analysis Area.....	102
Table 3.3.2. Summary of Soil Condition	104
Table 3.3.3. Activities with the Potential to Effect Soil Condition with Measures	106
Table 3.3.4. Summary of Measures of Project Effects for Soil Resources	110
Table 3.4.1. Sub-Watersheds within Puerco Analysis Area	112

Table 3.4.2. Springs in the Puerco Project Area	115
Table 3.4.3. Measures used to Assess Effects on Water Resources by Alternative	119
Table 3.5.1. Potential TES Species in the Puerco Project Area	123
Table 3.5.2. Species Considered but Not Evaluated	123
Table 3.5.3. Critical Habitat	124
Table 3.5.7. Watershed Condition Class for Zuni Bluehead Sucker Habitat	133
Table 3.5.8. Summary of Forest Service MIS evaluated for the Puerco Restoration EA.	140
Table 3.5.9. Ten MIS for the Cibola NF Mountain Districts their Habitat Type Associations, and Current Trends	142
Table 3.5.10. Percentage of acres by Vegetation type.....	143
Table 3.5.11. Description of PAC size within the project area, area within PACs that is proposed for treatment, proportion of PACs proposed for treatment, and proportion of proposed PAC treatment acres out of all PACs within the CNF.	158
Table 3.5.12. Acres of treatment proposed within each PAC and their proportion to total PAC acres.	158
Table 3.5.13. Proposed vegetation treatments (acres) proposed in Recovery Habitat (forage) and Recovery Habitat (Nest/Roost) within the Puerco project area. Areas within PACs proposed for treatment are included for analysis purposes. Proportions of proposed treatments out of total recovery habitat are included.	160
Table 3.5.14. Effects to Riparian Recovery Habitat	160
Table 3.5.15. Proposed vegetation treatments (acres) proposed in Critical Habitat within the Puerco project. Areas within PACs proposed for treatment are included for analysis purposes. Proportion of proposed treatments within Puerco project area Critical Habitat, Unit CP-2 of Critical Habitat, and total MSO Critical Habitat are included.	163
Table 3.6.1. ROS distribution in the analysis area	209
Table 3.7.1. Existing Scenic Integrity in Project Area	211
Table 3.7.2. Existing Visual Quality Objective in Project Area.....	212
Table 3.8.1. Road Miles by Maintenance Level	222
Figure 3.8.1. National Forest System Roads in the Puerco Project	224
Table 3.8.2. Road Access Concerns.	226
Table 3.10.1. Puerco Allotments and Proposed Treatments.....	233
Table A-1: Amendment 1: Current and Proposed MSO Forest Plan Language.....	262
Table A-2. Minimum Percentage of Restricted Area which should be managed to have Nest/Roost Characteristics (USDI 2012)	266
Table A-3. Alternative 2 Mexican spotted owl amendment 1 management area (MA) acres potentially affected by mechanical treatment up to 17.9 inches DBH	271
Table A-4: Amendment 2: Current and Proposed Goshawk Forest Plan Language	274
Table A-5. Preferred alternative amendment 2 management area (MA) acres potentially affected by canopy cover amendment	280

Table E-3. Responses to Mr. Dick Artley’s Opposing Science Attachments for the Puerco Collaborative Forest Landscape restoration Project	347
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List of Figures

Figure 1.2.1. Puerco Landscape Restoration Analysis & Treatment Area.....	3
Figure 1.4.1. Approximate Distribution of Existing Vegetation	9
Figure 1.5.1. General Location of the Desired Vegetation Cover Types	14
Figure 1.5.2. Illustration of Desired Spatial Arrangement of Leave Group	16
Figure 2.2.1. General locations for the proposed vegetation thinning and prescribed fire.....	33
Figure 2.2.2. Vegetation Treatment Types and Implementation Phases	45
Figure 2.2.3. System Roads and Unauthorized Roads.....	47
Figure 3.2.1. Pinyon-Juniper woodland, note high tree density and continuous vegetative cover.	85
Figure 3.2.2. Even-aged Ponderosa Pine Stand, Note dense tree stocking and lack of herbaceous understory	86
Figure 3.3.1. Soil Condition in the Puerco Analysis Area.	105
Figure 3.3.2. Proposed Puerco watershed improvements.	110
Figure 3.4.1. Water Resource Features within Puerco Project Watersheds	114
Figure 3.6.1. Developed Recreation Sites, Trails and Recreation Opportunity Spectrum.....	208
Figure 3.10.1. Proposed Range Improvements	238
Figure A-1: Amendment 1: General location of mechanical treatment up to 17.9- inch d.b.h...	261
Figure A-2: Amendment 2: General location of goshawk habitat.	272
Figure B-1. Bark Characteristics between young and old ponderosa pine.	282
Figure C-1. USFS System Roads.....	285
Figure C-2. Unauthorized Roads	286
Figure C-3. Travel Management Motor Vehicle Designations	287
Figure C-4. Seasonal Road Restrictions	288
Figure C-5a. Potential Puerco Haul Routes	289
Figure C-5b. Potential Puerco Haul Routes	290

1 Purpose of and Need for Action

1.1 Proposed Action

The Mount Taylor Ranger District of the Cibola National Forest and Grasslands (NF&NG) proposes the following actions to improve conditions in the Puerco Landscape Restoration Project:

- Commercially thin trees, including public fuelwood removal, and/or implement prescribed fire on approximately 31,442 acres.
- Implement prescribed fire alone on approximately 8,280 acres.
- Hand or mechanically thin and lop and scatter slash without prescribed fire to improve soil condition by improving ground cover and woody material on approximately 23,328 acres.
- Hand thin and implement prescribed fire on approximately 3,034 acres.
- Mechanically thin or masticate and implement prescribed fire on approximately 14,894 acres.
- Implement more intensive even-aged treatments on up to 5,900 acres of stands that are moderately to heavily-infected with dwarf mistletoe.
- Mechanically thin and/or implement prescribed fire on up to 3,694 acres of Mexican spotted owl (MSO) protected activity centers (PACs), up to 1,346 acres of MSO recovery habitat, and approximately 3,248 acres (including 1,850 acres of dispersal PFAs) of northern goshawk post-fledging family areas (PFA).
- Rehabilitate up to 200 miles of unauthorized roads.
- Improve road drainage and crossings.
- Restore approximately 19 springs.
- Restore up to 250 acres of riparian areas including associated stream habitats for threatened, endangered, and sensitive aquatic species.
- Improve the function of streams, including gullies.
- Construct protective barriers around springs, aspen, and willows as needed for protection of approximately 300 acres.

This project is located primarily in McKinley County with the southeastern portion located in Cibola County, south of Interstate 40, southeast of the city of Gallup, New Mexico, with the following legal description: The legal description of the project area includes all or portions of Township 12 North, Range 15 West: Sections 6, 12, 14, 16, 22, and 23; Township 13 North, Range 14 West: Sections 5-7, 18, and 31; Township 13 North, Range 15 West: Sections 1-28, and 34; Township 13 North, Range 16 West: Sections 1-24, 26-34, and 36; Township 13 North, Range 17 West: Sections 1-3, 10-15, 22-24, 26, 34, and 36; Township 14 North, Range 15 West: Sections 4-10, 13-15, and 17-35; Township 14 North, Range 16 West, Sections: 1-3 and 5-36.

1.2 Background

This project was initiated in 2011, as part of the Zuni Mountain Priority Landscape set forth in the Forest Leadership Team (FLT) priorities as an extension to the Bluewater Landscape Restoration Project. The FLT, Mount Taylor Ranger District, New Mexico Game and Fish Department, the Zuni Mountains Collaborative group and Mount Taylor Landscape Team have recognized the need for landscape scale restoration and building mutually beneficial, cross jurisdictional working relationships. The purpose of this project is to protect community, cultural and natural resources at a landscape scale by implementing vegetation treatments for wildlife habitat and watershed improvement, and increase resiliency to natural disturbances. The level of documentation and analysis for this project, an Environmental Assessment (EA), is based on the initial analysis and comments received from the public in response to the proposed action.

The Puerco Landscape Restoration Project is a planning effort designed to restore forest resiliency and ecosystem function to ponderosa pine, mixed conifer and pinyon-juniper forests across the western Zuni Mountains of the Cibola National Forest (NF). Management Areas included within the Puerco Project are described in Table 1.2.1. (1996 Amended Cibola National Forest Land and Resource Management Plan (ALRMP)).

Table 1.2.1. Puerco Management Areas

Management Area (MA) ¹	Management Emphasis
MA 8 – Ponderosa Pine Suitable Timberlands 36,302 acres	The primary management emphasis is on regulated even-aged timber management ² . Slash from timber harvests will be made available to the public as firewood. Opportunity for dispersed and developed recreational experiences will increase through new construction and rehabilitation of existing facilities. Wildlife habitat will be enhanced through structural and nonstructural improvements and through coordination of timber management activities. Grazing use will be balanced with grazing capacity.
MA10 – Mixed Conifer Suitable Timberlands 155 acres	Primary emphasis is on wildlife, especially those species favoring late successional stage vegetation. Grazing use will be balanced with grazing capacity.
MA 13 - No Capacity Rangelands 12,378 acres	The primary emphasis is on wildlife management activities. Wildlife habitat carrying capacity will increase through structural and nonstructural improvements. Firewood will be provided as a result of wildlife management practices.

¹ MA acres from the 1985 Forest Plan do not add up to the project area total because of acres that have been subsequently acquired by the Cibola National Forest, such as Tampico Springs Ranch.

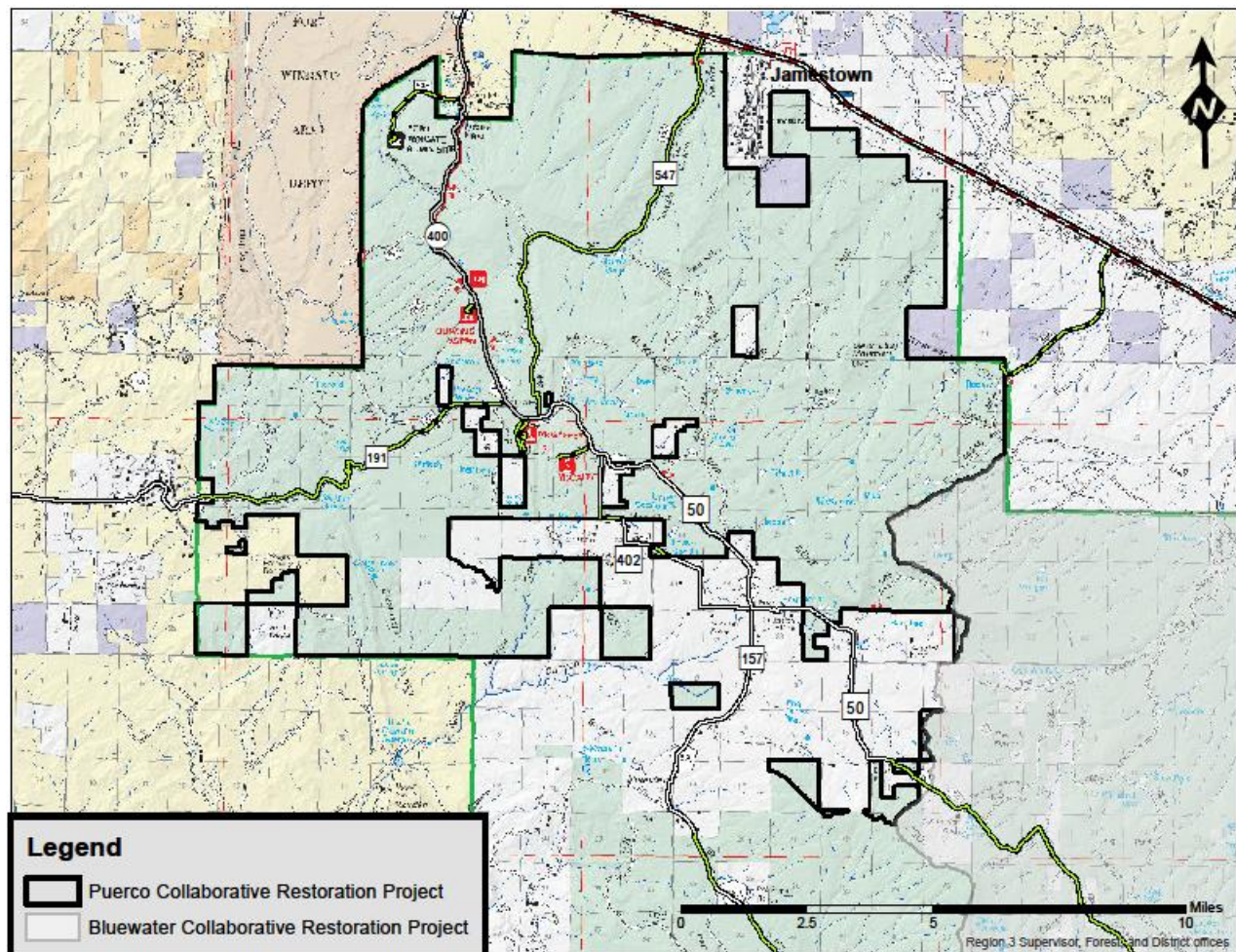
² This is original 1985 Cibola Land and Resource Management Plan language. The plan was amended in 1996 to incorporate direction from the Mexican Spotted Owl Recovery Plan (1995) and Management Recommendations for the Northern Goshawk (1992) to emphasize uneven-aged management.

Puerco Collaborative Forest Landscape Restoration Project

Management Area (MA) ¹	Management Emphasis
MA 14 – Full Capacity Rangelands 28,604 acres	Pinyon-juniper will be managed for personal use and commercial firewood. Grazing use will be balanced with capacity. Wildlife habitat will be enhanced through structural and nonstructural improvements and from integrating range and firewood management activities with wildlife habitat needs. Zuni Bluehead Sucker habitat will be protected. Maintenance and protection of sensitive soils is an important management objective.

In 2003, the Record of Decision for the Bluewater environmental impact statement (EIS) for the eastern portion of the Zuni Mountains of the Cibola NF was signed. The Puerco Landscape Restoration Project continues that ecosystem restoration effort on about 81,000 acres covering the western portion of the Zuni Mountains on the Mount Taylor Ranger District of the Cibola NF. The project area includes portions of Cibola and McKinley Counties.

Figure 1.2.1. Puerco Landscape Restoration Analysis & Treatment Area



1.3 Purpose of and Need for Action

The purpose and need for the Puerco Landscape Restoration Project was determined by comparing the existing conditions in the project area to the desired conditions in the Cibola National Forest Land and Resource Management Plan (ALRMP)³ related to forest and ecosystem function and resiliency. In addition, relevant research, the best available science and information, and the landscape restoration criteria found in the Omnibus Public Land Management Act of 2009 (P.L. 111-11, Title IV Forest Landscape Restoration) were used to develop the purpose and need. These criteria for landscape-scale restoration address community, wildlife habitat, and forest protection while retaining as many large trees as possible.

The purpose of the Puerco Project is to reestablish and restore forest structure and pattern, forest health, and vegetation composition and diversity in forest ecosystems to conditions within the natural range of variability, thus moving the project area toward the desired conditions. The outcome of improving structure and function is increased ecosystem resiliency. Resiliency allows for the ability of an ecological system to absorb disturbances, such as fire, insects and disease, and climate change, while retaining the same basic structure and ways of functioning and the capacity to adapt to stress and change (FSM 2020.5). This project is needed to:

- Increase forest, shrubland and grassland resiliency, sustainability
- Reduce the risk of uncharacteristic fire effects
- Improve wildlife and aquatic species habitat
- Improve the condition and function of watersheds
- Improve the condition and function of riparian areas, wet meadows, streams, and springs
- Preserve cultural resources

Forest Resiliency and Sustainability. Resiliency increases the ability of the pinyon-juniper woodlands, ponderosa pine and mixed conifer-frequent fire forest types to survive natural disturbances and stressors such as fire, insect and disease outbreaks, and climate change (FSM 2020.5). There is a need to restore the frequent low-severity fire regimes in which the forest in the Puerco Project area evolved. The Puerco Landscape Restoration Project is expected to move approximately 55,000 acres toward comprehensive, landscape-scale restoration (includes prescribed burning or a combination of thinning and burning).

There is a need to move tree group pattern, interspaces, and stand density toward the natural range of variability. This is a sum of reference conditions that provides a mix of open,

³ The Cibola NF is in the midst of revising its plan, this project will apply the 1985 Cibola Forest Plan (as amended). This project will incorporate the revised Forest Plan guidance upon plan implementation.

moderately closed, and closed canopy conditions at the fine (group) to landscape (ponderosa pine forest cover type) scales as defined by the Forest Plan. In the oak woodland and shrubland forest types, there is a need to stimulate new growth, maintain vigor in large-diameter trees, encourage faster growth in young smaller oaks, and provide for a variety of shapes and sizes of trees across the forest cover types. Where aspen is found in the frequent fire forest cover types, there is a need to stimulate growth, reduce conifer encroachment, and increase individual tree recruitment. In grassland forest cover types, there is a need to reduce or remove tree encroachment, which has decreased the size and function of these systems that were historically grasslands and savannas.

There is a need to manage forest density, structure, and composition to increase forest health and reduce adverse effects from bark beetles or dwarf mistletoe, while also providing a diversity of habitat types and features. Stand Exam data and dwarf mistletoe infection surveys indicate that 10,600 acres (13% of the project area) of ponderosa pine, pine-oak and mixed conifer forest types are moderately to heavily infected, where greater than 20% of the host trees or 25% of the area is infected. If management goals are to retain the host species (ponderosa pine and Douglas-fir) on the site, even-aged prescriptions are recommended (Conklin & Fairweather 2010). Of those moderately to heavily infected stands, approximately 5,900 acres (7% of the project area) have been identified as potentially suitable for more intensive even-aged management.

There is a need to improve the condition of native plant communities, improving the resiliency of rare species. There is also a need to improve understory vegetation to provide food and cover for wildlife where it is absent under dense forest stands where fire has been excluded.

The Puerco Project includes extensive areas where the ponderosa pine and mixed conifer forest cover types interface with the pinyon-juniper and deciduous oak woodland types. Because of this close association, treatments may be needed in these other forest cover types to facilitate and increase the effectiveness of treatments to restore the frequent fire forest structure.

Uncharacteristic Fire Effects. There is a need to reduce the risk of uncharacteristic fire behavior and effects, which currently pose a threat to ecosystem function and services, and human safety, lives, and values. Restoring forest, grass and shrubland structure will decrease the risks of post-fire flooding and debris flows that cause loss of soil productivity, water quality, and watershed function. Reducing the potential for uncharacteristic fire effects and reducing excessive fuel loadings will protect wildlife and aquatic species habitat, including areas within and adjacent to Mexican spotted owl habitat. Protected activity centers (PAC) currently contain high fuel loadings due to limited disturbance or management.

Wildlife and Aquatic Species Habitat. There is a need to move the Puerco Project area toward desired conditions for snags, coarse woody debris, forest structural stages, and stream habitat complexity that are currently deficit. There is a need to retain as many old and large trees as possible, recognizing the ecological and socio-political importance of these trees. Where restoration activities occur in the ponderosa pine and dry mixed conifer forest types, there is a

need to maintain and promote the development of old growth characteristics and components. There is a need to maintain or improve aquatic habitats to meet the needs of aquatic species, recognizing the ecological and socio-political importance of these streams and associated riparian areas.

The Zuni Bluehead Sucker is listed as an endangered species in New Mexico with 9.7 miles of critical habitat designated within the project area in Agua Remora, Rio Nutria and Tampico Creek drainages. Habitat management objectives and aquatic/riparian species protection measures from the approved Zuni Bluehead Sucker Recovery plan will be applied to all activities.

Streams and Springs. There is a need to improve the condition and function of riparian areas, wet meadows, streams, and springs in the Puerco Project area in order to sustain these features and aquatic habitat. Reducing road density and improving road and stream crossings would maintain natural flow regimes, provide connectivity for aquatic species and habitats, and reduce sedimentation. Approximately 2 miles of the Agua Remora drainage within the Puerco Project area has been designated as an eligible wild and scenic river because of outstanding remarkable values related to fish populations (Zuni Bluehead Sucker). In eligible rivers with “wild” classifications, cutting of trees and other vegetation shall not be allowed except when needed in association with a primitive recreation experience, to protect users (including hazard tree removal or trail maintenance), or to protect identified outstandingly remarkable values.

Roads. There is a need to have adequate access for project implementation, but then rehabilitate unauthorized routes identified during project implementation or the district Travel Management Rule review processes after use.

Cultural Resources. There is a need to reduce threats to cultural resources caused by overly dense vegetation and soil erosion. Though most archaeological sites can tolerate low severity fire, all are very vulnerable to the effects of high severity fire in unnaturally high fuel loads and to the soil loss that occurs in post-fire flooding. In particular, there is a need to reduce fuels accumulation around cultural resources to reduce threats to these non-renewable resources.

Water Developments. There is a need to improve distribution of water developments to benefit range and wildlife across the four allotments covered under this analysis. Many of these developments are not functional and are degrading the riparian ecosystems associated with them. Improved design and alternative water sources are needed to reduce impacts and move toward desired conditions.

Watershed Improvements. There is a need to improve watershed condition in the project area, which has been impacted by unnatural fire regimes, poor soil conditions, impaired riparian conditions, road and trail impacts, and range conditions. There is a need to implement vegetation

treatments that will restore natural fire regimes, and for other projects that will address other factors contributing to impaired watershed conditions.

Plan Amendments. To meet the project’s purpose and need, the existing Cibola Forest Plan would need to be amended to provide for areas of grass, forbs, and shrubs interspersed with tree groups and allow for treatments to move tree group patterns, interspaces, and stand density toward the natural range of variability. Amending the forest plan would allow for treatments that improve Mexican spotted owl nesting and roosting habitat as defined in the Revised 2012 Mexican spotted owl recovery plan. Amendment(s) to the Cibola Forest Plan would provide consistency in meeting desired conditions for ponderosa pine – Gambel oak and mixed conifer forest types across the Puerco Project area (Appendix A).

1.4 Existing Conditions

Vegetation

Tables 1.4.1 and 1.4.2 display project area acreage by existing vegetation cover type and existing conditions, while Figure 1.4.1 displays the general location of the existing vegetation cover types. Existing vegetation cover (forest) types are assigned by the Forest Vegetation Simulator (FVS) during the initial data analysis and imputation of Nearest Neighbor (NN) attributes for stands with no data collected. Imputation is a process of ‘filling in’ missing data with plausible values from sampled stands with similar attributes (slope, elevation, aspect). The Field Sampled Vegetation (FSVeg) Data Analyzer uses NN imputation methods to fill in the missing vegetation data with imputed data that is based on existing vegetation data from similar stands located within the project area and stored in the FSVeg corporate database.

Table 1.4.1. Acres of Existing Vegetation

Vegetation Cover Type	Approximate Acres
Quaking Aspen	14
Dry Mixed Conifer (frequent fire)	569
Ponderosa Pine	25,703
Ponderosa Pine-Gambel Oak	15,025
Pinyon-Juniper Woodland	25,701
Rocky Mountain Juniper	3,184
Grasslands/Shrublands	7,761
Other (Deciduous oak woodland, Miscellaneous Hardwoods and Non-stocked Forestlands)	3,021
	80,977

The forested landscapes in the Puerco project area are highly departed from their desired conditions, lacking desired multi-storied structure, spatial arrangement, and are very dense as

measured by basal area, trees per acre and percent canopy cover (Table 1.4.2). Because of the existing conditions most forest and woodlands in the project area are prone to uncharacteristic disturbances such as active crown fire behavior, insects and disease, and climate change. Other cover types, such as deciduous oak woodland, would also receive treatments to move toward desired cover types, improve wildlife habitat, reduce uncharacteristic fire risk, or restore natural fire regimes. Desired Conditions are discussed in more detail in Section 1.5 of this Chapter.

Table 1.4.2. Average Existing Forest Conditions

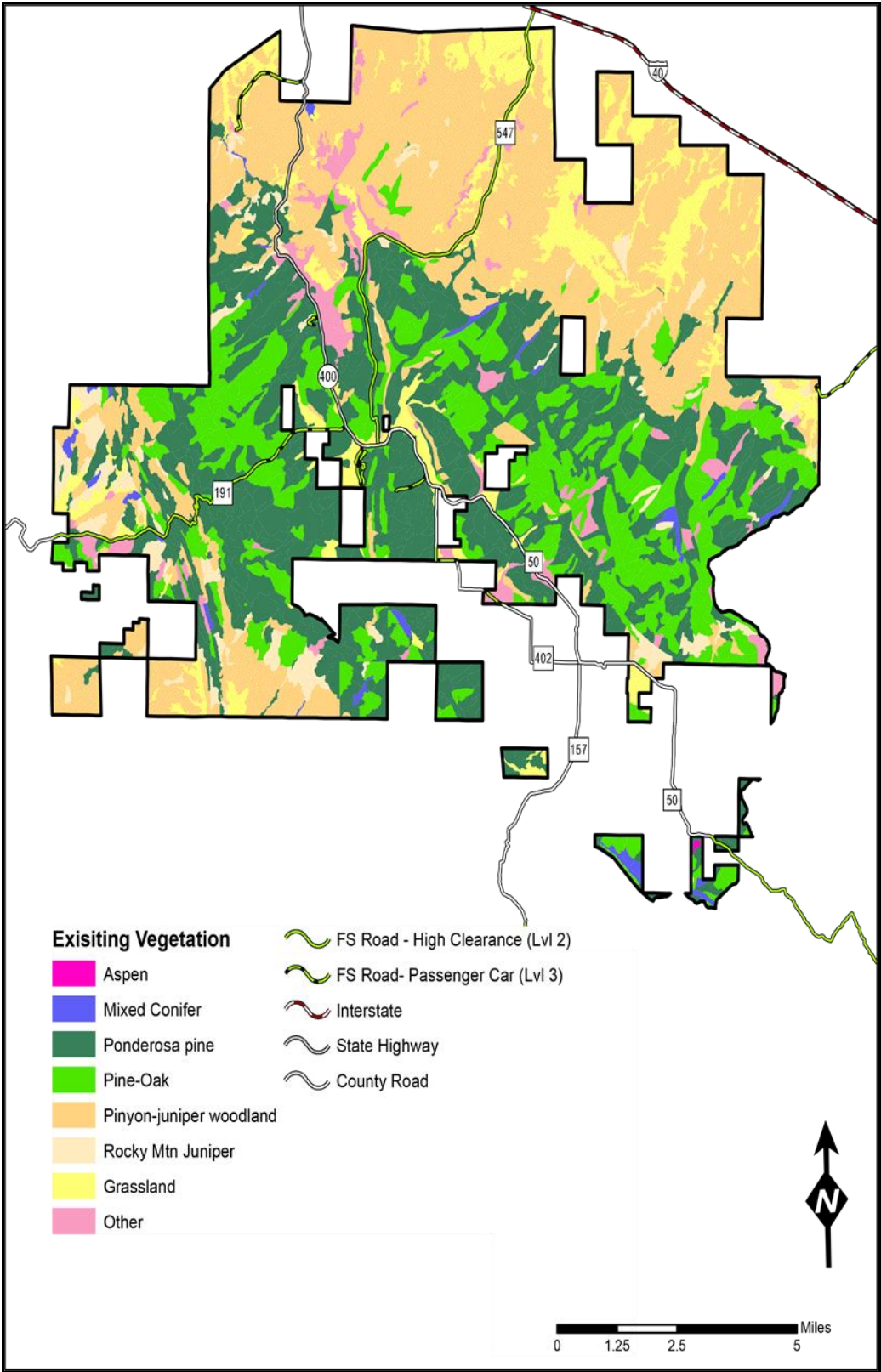
Existing Vegetation Cover Type	Basal Area/Acre (ft²)	Trees per Acre	Trees per Acre (5"+)	Trees per Acre (18"+)	Average Diameter (QMD 5"+)⁴	Canopy Cover (%)	DMR⁵	Crowning Index (MPH)⁶
Mixed Conifer	138	2,900	227	7	9.6	59	0.23	26
Ponderosa Pine	119	1,503	167	9	11.4	44	0.12	36
Ponderosa Pine-Gambel oak	127	1,513	167	10	10.7	45	0.09	38
Pinyon-juniper	116	1,103	152	10	11.2	41	0.34	27
Rocky Mtn. Juniper	127	1,932	171	9	11.0	45	0.0	51
Deciduous Oak	121	2,428	162	6	10.0	47	.01	59
Misc. Hardwoods	148	2,402	113	6	11.0	76	.001	34
	119	1,399	166	9	11.2	43	0.18	35

⁴ Quadratic Mean Diameter (QMD) is the diameter of the tree of average per tree basal area, which is considered more appropriate than arithmetic mean for characterizing a group of measured trees.

⁵ DMR is Dwarf Mistletoe Rating; the percentage of trees infected per acre.

⁶ Crowning Index is the open wind speed at which fully active crown fire is possible.

Figure 1.4.1. Approximate Distribution of Existing Vegetation



Several different fire regimes are represented across the project area, ranging from frequent low-intensity fires that historically occurred in ponderosa pine and dry mixed conifer (Fire Regime I: 0-35 year frequency) to mixed severity and stand replacing fires that occurred in pinyon-juniper woodlands (Fire Regime III-V: 35-100+ year frequency). Currently, across much of the project area, fuel loading and tree densities are such that mortality would be high in the event of a wildfire burning under undesirable conditions. The average crowning index across the project area is 35 miles per hour, which is fairly typical on spring day in the Zuni Mountains. In the grass and shrublands of the Puerco project, fire has been excluded and conifers have encroached into these naturally open areas, decreasing their size and function.

Quaking aspen in the Puerco project area does not occur in large pure stands, and is dying or rapidly declining due to the combined effects of conifer encroachment, browsing, insects, disease, and lack of fire disturbance. Aspen and willows provide habitat for songbirds and small mammals, as well as soil and stream bank stability, and are also declining in health, vigor, and number in the project area.

Stand Exam data and dwarf mistletoe infection surveys indicate that 10,600 acres (13% of the project area) of ponderosa pine, pine-oak and mixed conifer forest types are moderately to heavily infected, where greater than 20% of the host trees or 25% of the area is infected. If management goals are to retain the host species (ponderosa pine and Douglas-fir) on the site, even-aged prescriptions are recommended (Conklin & Fairweather 2010). Of those moderately to heavily infected stands, approximately 5,900 acres (7% of the project area) have been identified as potentially suitable for more intensive even-aged management.

Wildlife

Agua Remora is home to the Zuni Bluehead sucker population, a Federally-endangered species for which Agua Remora is one of only 3 locations where the species can still be found in the state of New Mexico and thus represents a nationally important population of this indigenous species. Approximately 602 acres of the Puerco project are included within the eligible wild and scenic river designation. Of this, 524 acres (87%) are also included within MSO PACs or on slopes exceeding 40%.

There are six Mexican spotted owl (MSO) protected activity centers (PAC), and four Northern goshawk post-fledging family areas (PFA) and three additional dispersal PFAs were created within the project area. There is a need to restore resilient late-successional forest and increase habitat diversity, particularly within MSO PACs and nest stands for the Northern goshawk.

Recreation and Scenery Management

The Puerco project area contains a wide range of recreation opportunities and infrastructure, including two developed picnic grounds, one developed group campground, seven motorized dispersed camping corridors, two trailheads, approximately 47 miles of national forest system

trails, and approximately 152 miles of existing national forest system roads (excluding those listed as decommissioned or converted).

In 2011, the Mount Taylor District Travel Management Decision Notice was released which designated national forest system (NFS) roads and NFS trails for motor vehicle use, including seven corridors designated along certain roads for motorized dispersed camping (see Figure 1.4.2) and prohibited motorized cross country travel. The Mount Taylor Motor Vehicle Use Map (MVUM) displays these designations. There are no defined locations for campfires within the dispersed camping corridors; as a result, users are creating multiple fire scars within each corridor.

Approximately 8 miles of maintenance level 3 roads are open and suitable for passenger cars. Even though motorized cross country travel is prohibited, approximately 200 miles of existing unauthorized roads are scattered across the landscape. These unauthorized roads are contributing to the degradation of watersheds, riparian ecosystems, wildlife habitat, and cultural resources. Many of these unauthorized roads provide access to areas that are currently departed from desired conditions.

Approximately 2 miles of the Agua Remora drainage has been designated as an Eligible Wild and Scenic River during the Cibola National Forest's Plan Revision process. Wild and Scenic Rivers are managed to protect or enhance existing outstanding remarkable values and classifications until designated or released from consideration. Agua Remora is eligible for fish population(s) and outstandingly remarkable values.

The only trailheads in the project area are Strawberry Canyon and Hilso. McGaffey Lake is a fishing site that is stocked by the New Mexico Department of Game and Fish (NMDGF).

Soil/Watershed

Many riparian streams in the Puerco project area are currently non-functioning or functioning-at-risk, due to a lack of adequate vegetation, landform, and woody material needed to filter sediment, dissipate stream energies, and support recharge to groundwater. Affected riparian areas include stream habitat for threatened, endangered, and sensitive aquatic species. Restoration is needed to restore the functionality of these streams, reestablishing former drainage patterns, restoring appropriate vegetation, woody material, and returning fire to the system (prescribed fire). Impaired intermittent and ephemeral stream channels are also in need of restoration, including reducing tree encroachment and noxious weeds, revegetating, and repairing headcuts.

Water Resource Features and Wetland/Riparian

Approximately 250 acres of riparian meadows and stream habitat are currently non-functioning or functioning-at-risk, due to a lack of adequate vegetation, landform, and woody material needed to filter sediment, dissipate stream energies, and support recharge to groundwater.

Affected riparian areas include stream habitat for threatened, endangered, and sensitive aquatic species.

At least 12 springs in the Puerco project area exhibit downward trends or static-degraded conditions. The condition and function of these springs needs to be improved to sustain these features.

Heritage and Cultural resources

In the Zuni Mountains and adjacent areas, there is evidence of Paleoindian, Archaic, Ancestral Pueblo, Navajo, and Anglo-European uses of the land in a span of time from about 12,000 years ago to the modern era.

Range Management

There are numerous water developments and infrastructure investments throughout the project area, including windmills, water tanks, stock troughs and corrals. Many of the existing developments are not functional and are contributing to the degradation of watersheds and the riparian ecosystems associated with them. Improved design and alternative water sources are needed to reduce impacts and move toward desired conditions.

Transportation

There are 151.7 miles of National Forest System (NFS) roads (system roads) in the analysis area. When referring to the route number of a system road, the acronym NFSR is often used. Table 1-4 displays the NFS road miles in the analysis area by maintenance level (ML).

Table 1.4.3. Road Miles by Maintenance Level.

Maintenance Level*	Length (miles)
1	11.2
2	132.4
3	8.1
Total	151.7

The Forest Service uses five maintenance levels: ML 1 to ML 5. An ML 1 road requires the least amount of maintenance effort and an ML 5, the greatest. There are no ML 5 roads in the analysis area. ML 1 roads are closed to all motorized traffic for periods exceeding one year. ML 2 roads are maintained for high clearance vehicles. These are typically single lane roads with a native material surface and limited turnouts. ML 3 and 4 roads are maintained for standard passenger cars and generally provide for a greater degree of driver comfort. ML 3 roads typically have a gravel surface, while ML 4 roads can be surfaced with either gravel or asphalt.

In addition to the system roads, there are approximately 200 miles of unauthorized routes that exist in the analysis area. The term unauthorized route can be defined as:

- a road or trail that was created by repeated off-road travel along the same path, without the knowledge and approval of the Forest Service, or
- a temporary road constructed by the Forest Service for a particular project that was not decommissioned when it was no longer needed.

Some of the unauthorized roads adversely affect the surrounding environment through degradation of wildlife habitat, vegetation or soil productivity, interruption of natural hydrologic processes, or disturbance to archeological sites. They also provide access for illegal wood product removal activities.

1.5 *Desired Conditions*

Vegetation

Overall desired vegetation conditions for the entire project area are for the composition, structure, and function of vegetative conditions to be resilient to the frequency, extent and severity of disturbances and climate variability. The mosaic of tree groups generally comprises an uneven-aged forest with all age classes present. Fires burn primarily on the forest floor and do not spread between tree groups as crown fire. Desired conditions for other resources will largely be maintained or improved by vegetation management and prescribed fire treatments designed to meet desired conditions, and these restoration activities would be implemented so that they would not increase departure of the associated natural resources.

Desired condition acres for each vegetation cover type were determined from Terrestrial Ecosystem Unit Inventory (TEUI) data collected from the Cibola National Forest. The terrestrial ecosystem survey maps ecosystems across landscapes based on climate, geology, soils, and late-successional vegetation. The major concept underpinning this system is that climate, geology, soils, and vegetation are interrelated and form repeating combinations across the landscape that can be classified and mapped (Abella et al 2011). Data provided from individual TEUI map units, in conjunction the Cibola Land and Resource Management Plan (LRMP) (USDA 1996) direction were used as a guide to develop desired conditions for species composition and vegetation cover type across the project area. Figure 1.5.1 displays the general location of the desired vegetation cover types. Table 1.5.1 displays the distribution of desired vegetation cover types based on the TEUI.

Table 1.5.1. Acres of Desired Vegetation

Vegetation Cover Type	Approximate Acres
Dry Mixed Conifer (frequent fire)	775
Ponderosa Pine	24,971
Ponderosa Pine-Gambel Oak	15,025
Ponderosa Pine / P-J Mix	13,403
Pinyon-Juniper Woodland	18,545

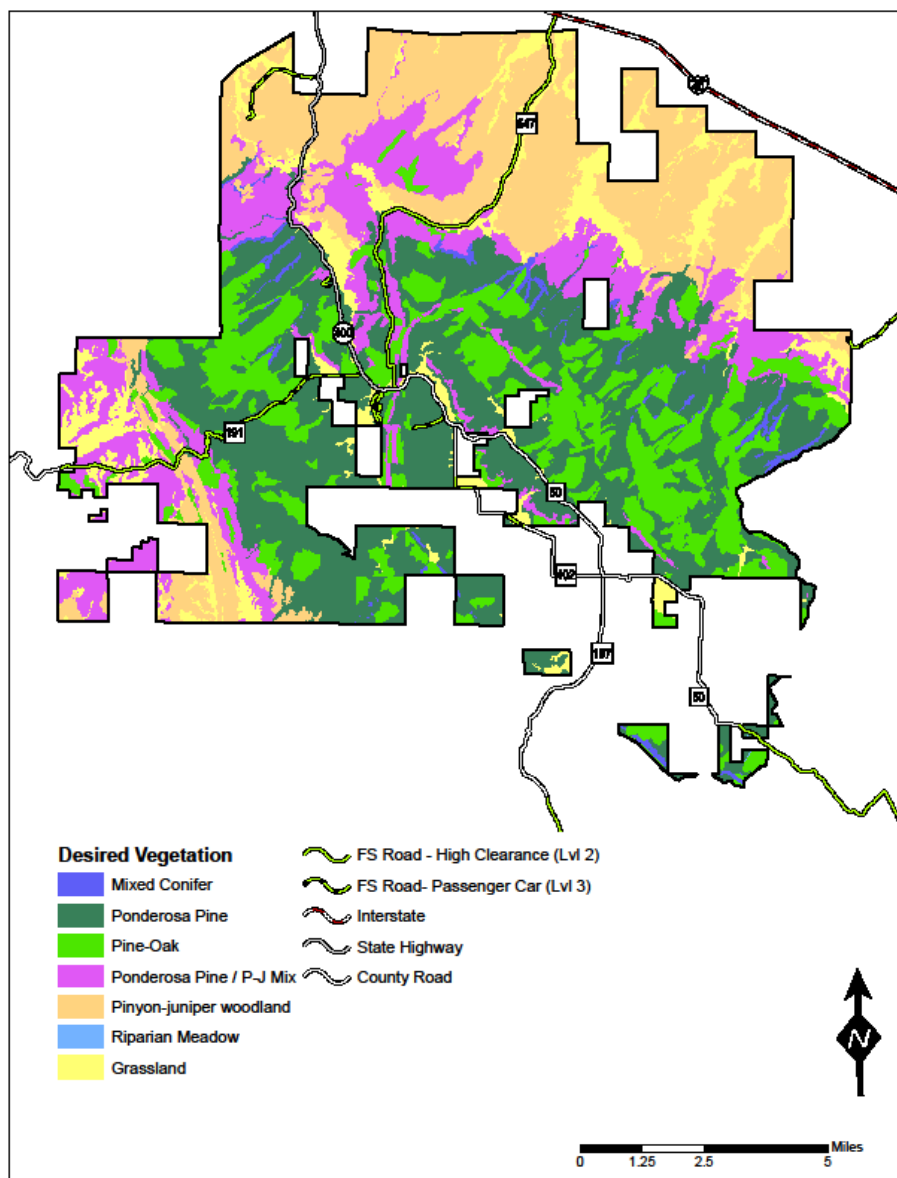
Puerco Collaborative Forest Landscape Restoration Project

Grassland/Shrubland	8,237
Riparian Meadow	22
	80,977

*Aspen is included within mixed conifer, ponderosa pine, and pine-oak types.

The acres of existing vegetation cover types differ from the desired vegetation distribution because of a variety and combination disturbances, plant succession, and past management activities such as timber harvesting practices, fire exclusion, and grazing. Treatments described in the Proposed Action Alternative would move vegetation toward more desired composition and distribution as described in the Cibola ALRMP and TEUI Inventory.

Figure 1.5.1. General Location of the Desired Vegetation Cover Types



Ponderosa Pine:

Within the ponderosa pine forest type the desired condition would be to provide goshawk habitat that is consistent with the northern goshawk guidelines (Cibola Land and Resources Management Plan (LRMP), page 71-5; *Management Recommendations for the Northern Goshawk in the Southwestern United States, General Technical Report RM-217. 1992*).

Tree density within forested areas generally ranges from 22 to 89 square foot basal area per acre (Reynolds et al. 2013). Size of tree groups is typically less than 1 acre, and most commonly ranges from 0.1 - 0.5 acres. Groups at the mid- to old-age stages consist of 2 to approximately 40 trees per group. Ground cover consists primarily of perennial grasses and forbs capable of carrying surface fire, with basal vegetation values ranging between about 5 and 20% depending on the TEUI unit (USDA Forest Service 1986, 2006).

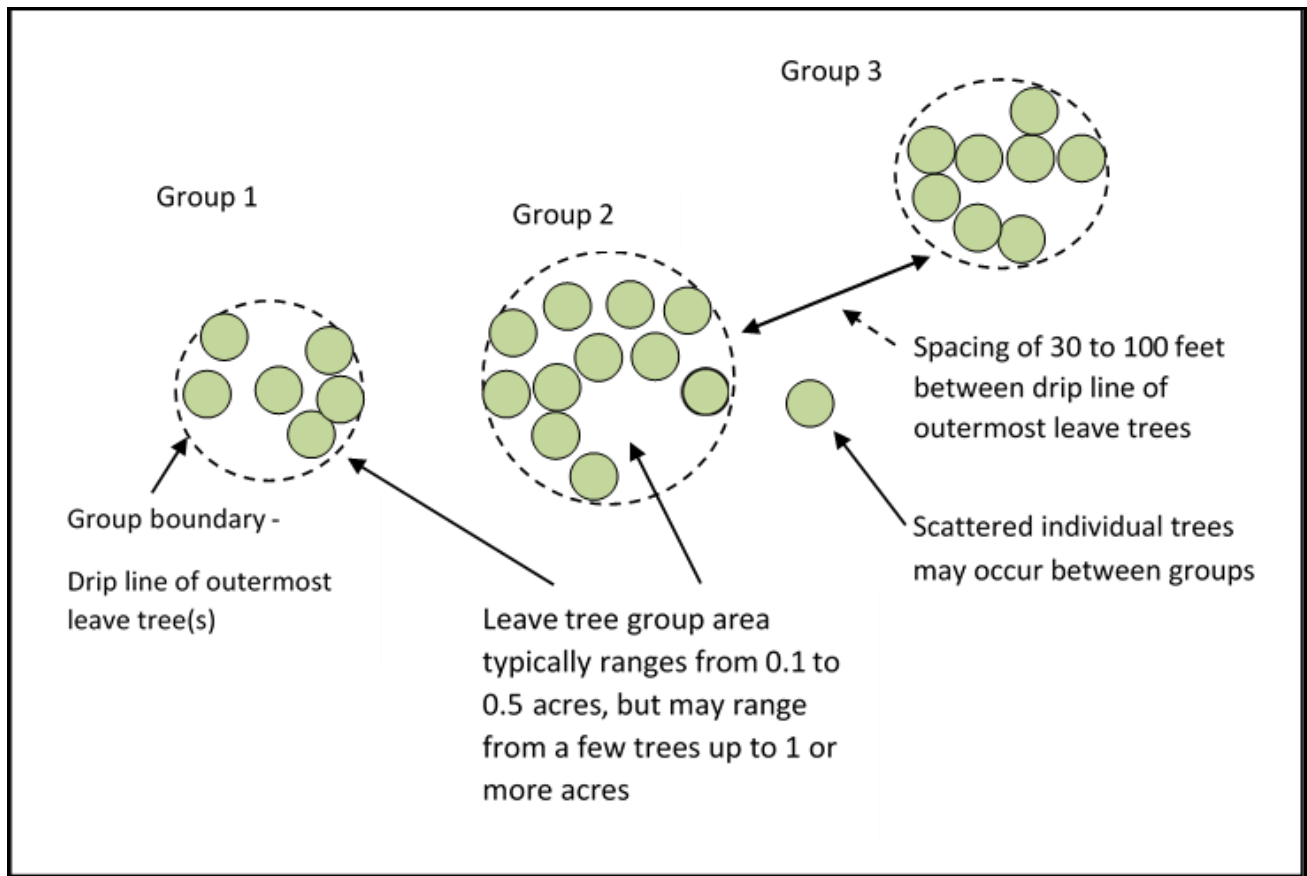
Overall the desired conditions include:

- Managing for uneven-age stand conditions for live trees to include a combination of tree groups and openings
- Retaining all trees 24" diameter at breast height (DBH) and greater, regardless of age, health or condition.
- Retaining snags (2/acre), large downed logs (3/acre), and woody debris levels (5-7 tons/acre) throughout woodland, ponderosa pine
- Managing for old age trees such that as much old forest structure as possible is sustained over time across the landscape
- Sustaining a mosaic of vegetation densities, age classes, canopy gaps and species composition across the landscape
- Maintaining a range of Vegetation Structural Stages ("VSS", or growth stages of living trees) - treatments would strive to achieve, over time, a VSS distribution of 10% VSS 1 (grasses, forbs, and shrubs); 10% VSS 2 (seedlings and saplings; 1"-4.9" DBH); 20% VSS 3 (young forest; 5"-11.9" DBH); 20% VSS 4 (mid-aged forest; 12"-17.9" DBH); 20% VSS 5 (mature forest; 18"-23.9" DBH); and 20% VSS 6 (old forest; 24"+ DBH) across the landscape.
- Within Goshawk Post Fledgling Family areas (PFAs) and dispersal PFAs, residual basal area per acre (ft²) would contain 10 percent or greater due to habitat needs compared to foraging areas (lands outside PFAs).
- Goshawk nest areas would consist of, or be managed to attain, a minimum 30-40 TPA in a size class distribution of VSS 5 (18-23.9" DBH) and/or 6 (24"+ DBH) where existing.
- On 20% of the desired 24,971 acres of ponderosa pine acres (approximately 4,994 acres) the desired condition will be to develop and maintain old growth conditions as defined in the LRMP Forest Wide Standards and Guidelines, page 66, Table "The Minimum Criteria for the Structural Attribute Used to Determine Old Growth" These areas would be designated during the environmental analysis process.

- Temporary openings, for regeneration purposes, may be up to four acres with a maximum width of 200 feet exist on approximately 10-20% of the area. Three to five reserve trees per acre are maintained as a seed source in openings greater than 1-acre in size.
- Dwarf-mistletoe occurs in less than 15 percent of host trees in uneven-aged forest structures and less than 25 percent in even-aged forest structures.

Forest conditions in goshawk post-fledging family areas (PFAs) are similar to general forest conditions except these forests contain 10 percent or higher basal area in mid- to old-age tree groups than in goshawk foraging areas and the general forest. Goshawk nest areas have forest conditions that are multi-aged but are dominated by large trees with relatively denser canopies than other areas in the ponderosa pine type. Figure 1.5 displays the general arrangement of leave groups and rooting zones that would remain after treatment in goshawk foraging areas. Not shown are the temporary openings created for regeneration purposes.

Figure 1.5.2. Illustration of Desired Spatial Arrangement of Leave Group



Ponderosa Pine – Gambel Oak:

This forest type would be treated similar to ponderosa pine, but additional emphasis placed on retaining and promoting the growth of additional large hardwoods (>5" diameter at root collar (drc), retention of ponderosa pine greater than 18" DBH, and retention large snags (>18" DBH) and downed logs (>18" DBH). Manage for at least 10% of total stand basal area (ft²) consisting of Gambel oak 5" DRC or greater, or 20 ft² of basal area per acre of Gambel oak. On 20% of the desired 15,033 acres of ponderosa pine – Gambel oak (approximately 3,007 acres) the desired condition will be to develop and maintain old growth conditions as defined in the LRMP Forest Wide Standards and Guidelines, page 66, Table "The Minimum Criteria for the Structural Attribute Used to Determine Old Growth" These areas would be designated during the environmental analysis process. Retain all trees 18" DBH and greater, per Mexican Spotted Owl recovery Plan (2012).

On a minimum of 10% of the 15,025 acres of desired pine-oak type (approximately 1,503 acres), manage for MSO Recovery Nest-Roost minimum desired conditions of:

- 30% of basal area in trees 12-18" DBH
- 30% of basal area in trees 18"+ DBH
- 110 square feet of basal area per acre
- Twelve 18"+ trees per acre.

Dry Mixed Conifer (frequent fire):

Dry mixed-conifer forests are dominated by shade-intolerant trees such as ponderosa pine, Douglas-fir, Southwestern white pine, quaking aspen, and other hardwoods. Trees typically occur in irregularly shaped groups, trees within groups are variably spaced, and group sizes generally range from a few trees up to about an acre in size, similar to ponderosa pine forest types.

Trees within groups are of similar or variable ages and groups are composed of one or more species. Crowns of trees within the mid-aged to old groups are interlocking or nearly interlocking. Size, shape, number of trees per group, and numbers of groups per area are variable. It is desirable that stands have an uneven-aged forest structure with an approximate balance of age classes ranging from young to old. Infrequently, stands of even-aged forest structure may be present. Surface fuels and small trees facilitate this fire regime. While fires burn primarily on the forest floor, occasionally individual trees or tree groups may torch. Crown fires rarely spread from tree group to tree group. Overall the desired conditions include:

- Managing for uneven-age stand conditions for live trees to include tree groups and openings. Trees typically occur in irregularly shaped groups and are variably-spaced with some tight clumps.

- Some natural openings contain individual trees or snags. Trees within groups are of similar or variable ages and one or more species. Size of tree groups typically is less than 1 acre.
- Crowns of trees within the mid- to old-age groups are interlocking or nearly interlocking. Interspaces surrounding tree groups are variably-shaped and comprised of a grass/forb/shrub mix. Groups at the mid- to old-age stages consist of 2 to approximately 50 trees per group.
- Openness typically ranges from 10 percent in more productive sites to 50 percent in the less productive sites.
- Tree density within forested areas generally ranges from 30 to 100 square foot basal area per acre.
- Managing for old age trees such that as much old forest structure as possible is sustained over time across the landscape. Retain all trees 18" DBH and greater that have no sign of insect or disease damage.

On a minimum of 25% of the 775 acres of desired mixed conifer type (approximately 194 acres), manage for Recovery Nest-Roost minimum desired conditions of:

- 30% of basal area in trees 12-18" DBH
- 30% of basal area in trees 18"+ DBH
- 120 square feet of basal area per acre
- Twelve 18"+ trees per acre.

The acres managed for Recovery Nest-Roost will meet the LRMP Forest Wide Standards and Guidelines, page 66, Table "The Minimum Criteria for the Structural Attribute Used to Determine Old Growth".

Ponderosa Pine & Pinyon-Juniper Mix:

These transition zones include a variable tree component that may range from sparse to relatively dense and may include any of the pinyon and juniper species, ponderosa pine and oak. It is desired to maintain uneven-aged conditions and sustain a mosaic of vegetation densities (overstory and understory), age classes, and species composition well distributed across the landscape. Overstory vegetation in trees ranges from about 15-50%, and ground cover consists of shrubs, perennial grasses, and forbs with basal vegetation values ranging between about 5 and 20% depending on the TEUI unit (USDA Forest Service 1986). Trees typically occur in even-aged patches, with patches ranging from young to old, and where patch size of (persistent) woodlands range to 10 of acres or larger (Muldavin et al. 2003). Retention of ponderosa pine will focus on the most vigorous and healthy dominant and co-dominant trees in irregularly sized-groups and stringers, while removing mid-story ladder fuels. Where pinyon-juniper dominates, focus will be on thinning from below and restoring historic openings between tree groups.

Ponderosa Pine - Tree density within ponderosa pine dominated areas generally ranges from 22 to 89 square foot basal area per acre (Reynolds et al. 2013). Size of tree groups typically is

less than 1 acre, but averages 0.5 acres. Groups at the mid- to old-age stages consist of 2 to approximately 40 trees per group. All trees 24" DBH and greater, regardless of health or condition, will be retained.

P-J Woodland – In areas dominated by P-J Woodland, trees occur as individuals or in smaller groups ranging from young to old. Typically groups are even-aged in structure with all ages represented across the landscape for an overall uneven-aged grouped appearance. Patch sizes of woodlands range from individual trees and clumps that are less than one-tenth acre, to tree groups of approximately an acre, and occasionally from 1 to 10s of acres.

- ♦ On 20% of the desired 13,403 acres of Ponderosa Pine / P-J Mix (approximately 2,681 acres) the desired condition will be to develop and maintain old growth conditions as defined in the LRMP Forest Wide Standards and Guidelines, page 66, Table “The Minimum Criteria for the Structural Attribute Used to Determine Old Growth” These areas would be designated during the environmental analysis process.

Pinyon - Juniper:

The pinyon-juniper (P-J) vegetation community in the Puerco Project is primarily composed of P-J Woodland, with a small amount of P-J Grass. These are dominated by one or more species of pinyon pine and/or juniper and can occur with a grass/forb dominated understory (P-J grassland), or a discontinuous understory of some grasses and/or shrubs (P-J Woodland). Two-needle pinyon pine and One-seed juniper are common. Rocky Mountain and alligator junipers are well-represented, with a lesser abundance of oaks. Species composition and stand structure vary by location primarily due to precipitation, elevation, temperature, and soil type.

On 20% of 18,545 P-J acres (approximately 3,709 acres) the desired condition will be to develop and maintain old growth conditions as defined in the LRMP Forest Wide Standards and Guidelines found on page 66, Table “The Minimum Criteria for the Structural Attribute Used to Determine Old Growth” These areas would be designated during the environmental analysis process.

P-J Woodland - trees occur as individuals or in smaller groups ranging from young to old. Typically groups are even-aged in structure with all ages represented across the landscape for an overall uneven-aged grouped appearance. The patch size of woodlands ranges from 1 to 10s of acres.

P-J Grass (Savanna) - is generally uneven aged and open in appearance. Trees occur as individuals, but occasionally in smaller groups, and range from young to old. Patch sizes of woodlands range from individual trees and clumps that are less than one-tenth acre, to tree groups of approximately an acre (Muldavin et al. 2003).

Grasslands/Shrublands:

Approximately 8,237 acres of grassland and shrubland types, based on TEUI, would be moved toward the following desired conditions:

Sagebrush Shrubland – Historically dominated by big sagebrush and primarily occurs adjacent to Great Basin grassland and pinyon juniper woodlands. While big sagebrush is the dominant species, other shrubs and grasses and forbs are present. Historically, tree canopy cover exceeded 10%, with the exception of early, post-fire plant communities (USDA 2015). The historic average fire return interval was 35–200 years from mixed-severity fire. Sagebrush shrubland is highly departed for vegetation structure, species composition, and patch size (too small), ecological need for change may hinge on restoring the historic mixed-severity fire regime.

Colorado Plateau/Great Basin Grassland - In general, found at lower elevations with vegetation coverage consisting of mostly grasses and interspersed shrubs. May have had over 10% shrub cover historically, but had less than 10% tree cover. The historic average fire return interval was 0–35 years from stand-replacing fire; however, most recent fires have been non-lethal. Departure is moderate with moderate–high risk from vegetation structure, high risk from altered fire regime, and high risk from decreased patch size, future management should strive to restore vegetation structure to reference conditions. In turn, this may simultaneously (either passively or actively) return fire regime and patch size to reference conditions (USDA 2015).

Montane/Subalpine Grassland - Occurs at elevations ranging from 8,000-11,000 feet, and often harbors several plant associations with varying dominant grasses and herbaceous species. Trees may occur along the periphery of the meadows, and some shrubs may also be present. These meadows are seasonally wet, which is closely tied to snowmelt. They typically do not experience flooding events. Historically, tree and shrub canopy cover were each less than 10% and stand-replacing fires occurred every 0–35 years. The most substantial risks are from a lack of frequent stand-replacing fire and patch size (currently highly departed; too small). May be considered especially sensitive to climate change, as it occurs at the highest elevations and is therefore incapable of uphill migration as a climate change response. Future management should use stand-replacing fire to reduce tree encroachment, increase patch size, and potentially restore species composition.

Fuels and Fire Behavior

The best way to alleviate the potential of unwanted large destructive fires within the project area is to create fuel situations that would reduce the energy output of fire starts to a point where conventional firefighting methods can be effective. A condition in which natural and/or prescribed fire is used to maintain fuel loadings and tree densities is desired. The desired outcome of the treatments is to reduce the likelihood of large scale crown fires and to provide fire management forces the opportunity to manage fires for ecosystem benefits.

Desired future conditions would mimic natural ecosystem traits, having a diverse mosaic of fuels that are arranged in a fashion not subject to uncharacteristic wildfire. The desired condition would have; fewer trees, especially small diameter trees, that act as ladder fuels and increase the risk of torching, and an open canopy with lower crown bulk density which reduces the risk of sustained crown fire. The ecosystem should be resilient to natural disturbance events including fire, drought, disease, and insect infestations. A desired future condition would allow fire to play

its natural role in the environment, and be maintained in a manner to alleviate resistance to control.

- An average FRCC of 1 is desired across the Puerco Landscape analysis area.
- Desired future conditions would have canopy bulk densities at or below 0.0065 lb./ft³ in any given stand in order to minimize the potential of a sustained crown fire.
- Fuel loadings (tons/acre) and crown bulk density (CBD), around wildland/urban interface should be lower in order to reduce fire hazard. *Crown Bulk Density* is an indicator of the incidence of interlocking crowns which can tell us how a crown fire can spread. CBD is the primary controlling factor of crown fire behavior and it depends on both species composition and stand density (Graham and others 1999). CBD is measured in lb. per ft. cubed and is the amount of mass in the canopy of a stand. In general, the lower the CBD, the higher the wind speed has to be to sustain a crown fire.
- Desired fuel loadings in ponderosa pine and P-J are 5 to 7 tons per acre and in mixed conifer 10 to 15 tons per acre over the project area.

Wildlife

- Native ecosystems are within reference conditions, are distributed throughout their potential range, and are sustainable across the Forest and able to support a full complement of native species.
- Habitat conditions and compatible multiple uses contribute to the recovery of federally listed species and the persistence of species of conservation concern.
- Habitat configuration and availability allow wildlife populations to adjust their movements in response to major disturbances (such as climate change and uncharacteristic fire) and promote genetic flow between wildlife populations across the Forest and beyond.

Recreation and Scenery Management

- The recreation program is integrated into all forest resource management decisions and activities and is adaptable to changes in recreation use and trends.
- Forest thinning and related actions are integrated with recreation and scenery objectives to enhance scenic quality, to impede future illegal motorized cross-country travel.
- Vegetation management activities along road and trail corridors are designed to reinforce travel management objectives of keeping motor vehicles on the designated routes and prohibiting motorized cross-country travel by not opening up large swaths of ground without barriers along the corridors.
- Provide high quality campground and picnic grounds with adjacent trail opportunities, sufficient screening, reduced overhead hazards, and a vibrant uneven-aged forest canopy.
- Scenery management, scenic character, and scenery values are integrated into the design, planning, and implementation of all resource management decisions.

- High quality scenery and scenic values are protected in areas of high public use, such as scenic byways, major roads and trails, and developed recreation sites.
- Scenic resources and scenic character reflect ecosystem diversity, enhance the recreation settings, and contribute to the quality of life of local residents and communities.
- The Agua Remora eligible wild and scenic river corridor is managed to protect or enhance existing outstanding remarkable values and classifications until designated or released from consideration.
- Desired conditions for Agua Remora provide for the necessary ecological conditions to contribute to the recovery and maintenance or restoration of critical habitats for threatened and endangered species and integration of habitat management objectives and species protection measures from the most recent approved recovery plan.

Soil/Watershed

- Soil condition is satisfactory, soil functions are sustained and soil is functioning properly. The ability of soil to maintain resource values and sustain outputs is high.
- Vegetation contributes to soil condition, nutrient cycling, and hydrologic regimes at natural levels.
- Downed woody material occurs at levels (size, decay, and amount) sufficient to support soil productivity.
- Soils do not exhibit excessive rill, sheet, or gully erosion.
- More than 50 percent of each 12 digit sub-watershed is in a satisfactory fire condition class as described in the watershed condition framework.
- No more than 20 percent of the forested land in each 12 digit sub-watershed should be at imminent risk of high levels of mortality due to insects and disease.
- Watersheds are not at risk due to the fuels composition and uncharacteristic disturbance.
- The hydrologic regime within a watershed is not impacted by the density and distribution of roads, trails, and impervious surfaces.

Water Resource Features and Wetland/Riparian

- Riparian areas are in proper functioning condition and support higher ecological values, including native plant species maintenance and regeneration, in stream flow, bank stabilization, visual and cultural resource properties.
- Sufficient reproduction of native species appropriate to the site is occurring to ensure sustainability.
- Native riparian plants such as willow (such as Bebb, peachleaf) are reproducing with all age classes present where the potential exists.
- Bank characteristics including vegetation are stable within the natural range of variability.
- In aquatic and riparian systems that evolved with wood near the streams, large woody material is present and continues to be recruited into the system at near natural rates.

- Springs, riparian areas, and wetlands have the necessary soil, water, and vegetation attributes to be healthy and properly functioning

Puerco Aquatic Resources:

- Shade: Shading over perennial and intermittent water surfaces that is at least 80 percent of natural levels.
- Bank Cover: Natural bank protection of at least 80 percent of natural levels. Stream bank stability provided by woody plant roots, particularly on outside bends of stream channel meanders.
- Streambed Sedimentation: Composition of sand, silt, and clays within streambeds should not exceed 20 percent of natural levels.
- Habitat: Aquatic pools are wet for longer periods of time to provide persistent habitat for aquatic species

Puerco Riparian Vegetation Resource (where site is capable of supporting woody plants):

- Species Composition: 60 percent of woody plant composition in three or more riparian species or as appropriate for the site .
- Plant Structure: Three age classes of riparian woody plants with at least 10 percent of the woody plant cover in the sprout seedling and sapling stages and 10 percent in the mature and over-mature.
- Crown Cover: Both trees and shrubs are at least 60 percent of natural levels
- Ground Cover: Ground cover and litter for site and overstory conditions.

Heritage and Cultural Resources

- As a result of this project, no physical destruction of or damage to any cultural/heritage property.
- All cultural/heritage properties will remain undisturbed in their current locations historic location.
- There will be no change of the character of a property's use or of physical features within the property's setting that contribute to its historic significance.
- No visual, atmospheric or audible elements that diminish the integrity of a property's significant historic features will be introduced.

Range Management

- Livestock grazing and associated management activities are in balance with the needs of wildlife forage, watershed ground cover, natural fire regime, and resilience to climate variability.
- Herbaceous native plant communities occur within the natural range of variability.
- Range improvements minimize impacts to soil, watershed, and wildlife resources.

- Sustainable livestock grazing contributes to the long-term socioeconomic and diversity and stability of rural communities and the cultural identity tied in with traditional uses.

Transportation

- Unauthorized roads are decommissioned after restoration and prescribed fire treatments are completed to reduce resource damage to soils, water quality, wildlife habitat, and heritage resources.
- Basic custodial maintenance is performed to keep damage to adjacent resources to an acceptable level and to perpetuate the road to facilitate future management activities. Emphasis is given to maintaining drainage facilities and runoff patterns.

1.6 Decision Framework

The decisions to be made are:

- Whether or not to restore ecosystem conditions through vegetation treatments, including individual tree and group selection, creating temporary regeneration openings, thinning, mastication, and fuelwood gathering;
- Whether or not to manage up to 5,900 acres of moderately to heavily dwarf mistletoe-infected stands with even-aged silvicultural treatments;
- Whether or not to reduce fuel loads and what prescribed fire actions to take;
- Whether or not to improve riparian areas, including installation of protective barriers
- Whether or not to perform treatments designed to restore up 19 springs;
- Whether or not to rehabilitate up 200 miles of unauthorized roads;
- Whether or not to modify existing and construct additional infrastructural needs such as wells, pipelines, cattle guards, fences and dirt tanks;
- Whether or not to install wildlife trick tanks;
- Whether or not to amend the forest plan to provide for areas of grass, forbs, and shrubs interspersed with tree groups and allow for treatments to move tree group patterns, interspaces, and stand density toward the natural range of variability;
- Whether to amend the forest plan would allow for treatments that improve Mexican spotted owl nesting and roosting habitat as defined in the Revised 2012 Mexican spotted owl recovery plan.

1.7 Public Involvement

On March 14, 2017, a scoping letter with links to a detailed Proposed Action was mailed to approximately 145 different agencies, businesses, individuals, tribes, and organizations interested in or determined to be potentially impacted by the proposed project. Comments were requested by April 14, 2017, but comments received after that date were accepted and considered. In addition, the proposal was posted on the Cibola NF&G website on March 10th and was published

in the Schedule of Proposed Actions on April 1, 2017. See Project Record for a list of comments received. Comments received during scoping were used to develop a list of issues and these issues helped guide the development of alternatives.

On April 4, 2017 the proposed action for Puerco Project was presented at the Zuni Mountains Collaborative Meeting held in Gallup, NM. Formed in 2005, the purpose of the Zuni Mountains Collaborative is to provide recommendations for actions concerning the use and management of lands and waters within the Zuni Mountain Landscape in west-central New Mexico. On April 5, 2017 the proposed action was also presented at a public meeting held in Grants, NM. A field tour of the Puerco Project area was conducted on June 6, 2017 visiting numerous sites across the project area to view existing conditions and discuss needs for change and proposed treatments.

The Cibola National Forest consults with seven American Indian Tribes and 13 Chapters of the Navajo Nation regarding proposed projects and management activities on the Mt. Taylor Ranger District. These include: the Hopi Tribe, the Navajo Nation, and the Pueblos of Acoma, Laguna, Zuni, Jemez, and Santa Ana and the following Navajo chapters: Baca/Prewitt, Casamero Lake, Crownpoint, Mariano Lake, Ojo Encino, Ramah, Smith Lake, Thoreau, To'hajiilee, Torreon, Whitehorse Lake. In 2016, the Forest began consulting with the Baahaali and Churchrock Chapters.

Consultation pursuant to Section 106 of the National Historic Preservation Act was initiated in 2013. The Puerco Landscape Restoration project was highlighted in the Forest's annual project consultation letter sent to the Tribes and Chapters in 2013, and again in 2014 and 2015. Project consultation meetings were initiated in the summer of 2013 and have continued into 2018. The Cibola National Forest has received additional comments during project consultation and other meetings.

The Forest Stewards Guild hosted meetings with the Cibola National Forest and the Pueblos of Acoma, Zuni, and Laguna, as well as the Ramah and Baahaali Chapters in 2016 to discuss new and expanded opportunities for collaboration in the Zuni Mountains. The Puerco project was discussed as a part of those meetings. In June 2017, the Forest Stewards Guild assisted the Cibola National Forest in organizing a fieldtrip to the Puerco project area to look at existing conditions, and discuss desired conditions and proposed treatments. Correspondence related to the fieldtrip was sent to the neighboring Tribes and the two Chapters that share a common boundary and/or have expressed an active interest in restoration work in the Zuni Mountains. A representative from the Pueblo of Zuni participated in the field trip.

The Puerco project was added to the SOPA (Schedule of Proposed Actions) in January 2017. A scoping letter (letter dated 3/14/2017) was sent to all the Tribes and Chapters. That letter contained an invitation to a public meeting which was held on 4/5/2017. One tribal representative, from the Pueblo of Laguna, attended the public meeting. The Forest received written comments from one Tribe in response to scoping. In a letter dated 3/27/2017, the Hopi

Tribe's Cultural Preservation Office expressed its interest in continued consultation on the project, as well as a copy of the cultural resource survey report(s) and any proposed treatment plan, *if* the project will adversely affect prehistoric cultural sites. The letter states that the Tribe supports the identification and avoidance of prehistoric sites. A consultation meeting was held with the Hopi Tribe in early July 2017. The Tribe made a request that the Forest invest some effort into identifying traditionally-used plants within the Puerco project area. Desert Tobacco (*Nicotiana obtusifolia*) was specifically mentioned, and a comment made that it responds well to prescribed burning.

A field-based consultation meeting was held with the Navajo Nation Historic Preservation Department and the Baahaali Chapter in November 2017. One objective of the fieldtrip was to determine an appropriate course of action to ensure that cultural items potentially affiliated with the Navajo remain undisturbed during project implementation. Another objective was to look at the treatments proposed in and around the Hogback. The project area was expanded westward to include the Hogback and extend all the way to the Forest's common boundary with the Baahaali Chapter and the Pueblo of Zuni, based upon input received from the Chapter at a meeting in 2016. During the field consultation, the Navajo Nation provided input on the proposal to treat two-culturally significant landscape features using prescribed fire, as well recommendations for avoiding impact to the identified cultural items. This input has been incorporated into the proposed action.

A meeting with Zuni Mountains Collaborative Group was held on July 17, 2018 in Grants, NM, where the modified proposed action and timeline for the Puerco project was shared with participants. A sign-up sheet was made available for attendees who wanted to be included on the project mailing list.

On November 5, 2018, the final environmental assessment (EA) and draft decision notice (DN) for the Puerco Collaborative Forest Landscape Restoration Project was released to the public and a legal notice was posted in the Albuquerque Journal starting the 45-day Objection Period.

On December 3, 2018, the Responsible Official provided notice in the Albuquerque Journal that the Objection Process initiated on November 5th was being cancelled, and that any objections filed on or after November 6th in response to the previous legal notice would be set aside from review per 36 CFR 218.10 (a)(9).

1.8 Issues

The Forest Service separated the issues into two groups: relevant and non-relevant to the proposed action. Relevant issues were defined as those directly or indirectly caused by implementing the proposed action. Non-relevant issues were identified as those: 1) outside the scope of the proposed action; 2) already decided by law, regulation, Forest Plan, or other higher level decision; 3) irrelevant to the decision to be made; or 4) conjectural and not supported by scientific or factual evidence. The Council for Environmental Quality (CEQ) NEPA regulations

require this delineation in Sec. 1501.7, "...identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)..." A list of non-significant issues and reasons regarding their categorization as non-significant may be found in the project record.

A total of 6 comments were received on the Puerco Collaborative Restoration Project. From the public comments received, the Forest Service did not identify any issues that would drive the analysis of any alternatives other than the Proposed Action and No Action Alternatives. Internal comments brought to light that a significant portion of the project area located on sensitive soils (Chinle Formation) had been proposed for thinning and burning treatments. Because these soils are in unsatisfactory condition with severe hazard, the proposed action has been modified to omit burning and limit thinning treatments to be done only by hand to protect the soil.

2 Alternatives

Two alternatives were analyzed in detail; the No Action (Alternative A) and the Proposed Action (Alternative B). The proposed action was developed to maximize attainment of the purpose and need. Alternative A provides a baseline for comparison to the Proposed Action.

2.1 Alternative A – No Action

None of the proposed management activities would be implemented under this alternative. No new treatments would be implemented to address existing vegetation, fuels, wildlife, watershed, or recreation concerns. Suppression of wildfire would continue but previously treated areas would not be maintained and no new treatment areas would be created. This alternative would not be consistent with the Cibola National Forest Land and Resources Management Plan (LRMP) over the long term as it would not meet the goals and objectives or provide the desired conditions described in the LRMP.

2.2 Alternative B – The Proposed Action

The Proposed Action was modified after public scoping. The following are changes that were incorporated into the Draft and carried forward into the Final EA:

1. During the field verification process after scoping, areas located in the northern portion of the project area on sensitive Chinle Formation soils were reclassified from hand thin, lop and scattering slash and prescribe burning to thinning, lop and scattering and no prescribe burning to protect soil conditions and reduce potential erosion. Proposed acres of hand thinning with no burning increased from approximately 4,500 to 23,000 acres.
2. During the field verification process after scoping, areas with poor road condition and access located in and around McKenzie Ridge in the northeastern portion of the project area were reclassified from thinning and prescribe burning to burn only, increasing from approximately 3,750 to 8,537 acres.
3. Acres of proposed commercial treatments were adjusted from 43,000 down to 31,400 acres.
4. Mexican Spotted Owl surveys conducted in 2017 found two new draft protected activity centers (Aqua Remora and Brennan Spring) located inside of the project area that will result in timing restrictions and less intensive treatments on 624 acres.
5. Dwarf mistletoe surveys were conducted in 2017 to field verify infection levels on over 10,000 acres determined that approximately 5,900 acres may be suitable for more intensive even-aged management treatments designed to improve forest health and resiliency.
6. To accommodate cultural concerns, burning as part of the proposed action was removed from approximately 257 acres of sensitive areas within the project.

The Proposed Action as originally scoped was revised and the new information (above) was carried through the Draft and Final EA proposed action alternative.

In addition, the project boundary was slightly modified after public scoping. It was noticed that the project boundaries for the Puerco Project and the adjacent Bluewater Ecosystem Management Project did not exactly match up along their shared borders. The Puerco Project boundary was adjusted so that there were no longer any overlap or gaps between the two projects, which resulted in a reduction of 9 acres, from 80,986 to 80,977 acres. This Final EA reflects that acreage change.

To meet the purpose and need for the Puerco Landscape Restoration Project and move toward desired conditions, the Cibola National Forest proposes a combination of mechanical thinning, mastication, prescribed fire, and other restoration activities throughout the project area that would make forests, shrub and grasslands more resilient to natural disturbances such as fire, insects and disease, and climate change. Restoration activities are needed to maintain or restore structure and pattern, the desired fire regimes, and watershed and ecosystem function in ponderosa pine, frequent fire mixed conifer, ponderosa pine-Gambel oak, pinyon-juniper woodlands, riparian, shrub and grassland cover types, moving them toward conditions within the natural range of variability. Other existing cover types, such as deciduous oak woodland, may also receive treatments to move toward desired cover types, improve wildlife habitat, reduce uncharacteristic fire risk, or restore natural fire regimes.

The proposed treatments will move these areas toward their desired conditions and help to reestablish functioning ecosystems that are sustainable and resilient. The proposed mechanical treatments (low thinning and uneven-aged selection cutting methods) are designed to establish openings and promote multi-aged stand structure, restore historic fire regimes, mitigate adverse effects of active crown fire, climate change and maintain or improve ecosystem health and function.

Implementing mechanical treatments and prescribed fire would decrease surface and canopy fuel loading, as well as ladder fuels in the immediate vicinity of desired trees and groups of trees. This would decrease potential fire-induced mortality in large and/or old trees, as well as in established seedlings and saplings needed to promote uneven-aged structure. Use of prescribed burning, particularly when combined with mechanical thinning, would reduce the potential for damage from wildfires (Fule et al 2012, Waltz et al 2014), as well as the costs associated with fire suppression.

Grass and shrub land restoration could include restoring sites to the potential natural vegetation as indicated by the Terrestrial Ecosystem Inventory (TEU). This could include prescribed fire or thinning to reduce or eliminate undesirable tree and shrubs as indicated the desired condition.

Spring restoration could occur at the 19 springs within the project area. Removal of old fencing and non-functional structures, headcut stabilization, salt cedar and Russian olive removal, selective hand thinning of non-riparian trees, and planting of appropriate native riparian vegetation are possible in these areas, as well as reestablishing or protecting native plant species

which currently exist or have been documented to exist in the area. Restoration of stream morphology may be needed in some areas. These same types of restoration activities could occur in riparian areas and water resource management zones along streams to move these areas to the desired condition.

Stream habitats and aquatic species depend upon perennial streams or reaches and their habitat is maintained by the watershed, soil, and riparian conditions within the ecosystem. Proposed stream habitat treatments may be needed within all or some portion of streams within the project area. Restoration treatments may include channel restoration (rock dams, grade control or induced meandering) and channel structural improvements (felling or girdling trees to provide large woody debris for cover and habitat complexity). All proposed riparian treatments would also improve or maintain stream habitat by restoring watershed function or resiliency. Treatments in watersheds may also improve soil condition, soil infiltration and subsurface flows.

To stimulate growth, recruit younger age classes, and increase individual recruitment of aspen, competing conifers would be thinned from within and around existing aspen where they occur within other vegetative cover types. Protective barriers may be placed around aspen to reduce browsing and other disturbances, recruit younger age classes, increase populations, and retain these diverse habitats. Stand replacing disturbances in riparian aspen are uncommon and restoration of ecological processes such as flooding, restoring water, and reducing erosion are more appropriate in these areas.

Proposed treatment types are developed based upon the combination of existing conditions, soil condition and erosion hazard determined from Terrestrial Ecosystem Unit Inventory data. Table 2.2.1 displays proposed activities based upon current soil condition and erosion hazard. Where existing vegetation conditions are not highly departed from desired conditions, less intensive treatments such as hand thinning or burn only may be prescribed.

The existing condition for ponderosa pine, pine-oak, and mixed conifer forest types is deficient of large and old trees greater across the landscape. The Cibola National Forest Supervisor made the decision in November 2015 that within the Zuni Mountain Collaborative Forest Landscape Restoration (CFLR) Project area, which includes the Puerco Project, an old and large tree retention strategy would be implemented. The strategy states that every effort should be made to conserve old trees to promote a balanced, uneven-aged forest condition that maintains, or contributes to the restoration of pre-settlement old growth conditions characteristic of the forest type. This should be achieved by retaining pre-settlement trees, often the largest and tallest trees on site. All trees greater than 24" diameter at breast height (DBH) will be retained on site regardless of condition or old tree characteristics, unless deemed an imminent hazard⁷ to people

⁷ A hazard tree is defined as a tree that has both: a structural defect that increases the chance of a tree or its parts to fail, and a target (people, buildings, cars, etc.) would be hit when the tree fails. USDA Forest Service, Southwestern Region. 2015. Tree Risk Detection and Management in the Southwestern Region.

Puerco Collaborative Forest Landscape Restoration Project
3. Environmental Consequences

or property. This strategy describes tree characteristics that are indicative of old trees (≈150 years old) such as bark, branching and form (Appendix B).

Table 2.2.1. Proposed Activities by Soil Condition and Erosion Hazard

Soil Condition	Erosion Hazard	Potential Activities	Acres
Satisfactory	Slight/ Moderate	Mechanical or Hand Thinning, Mastication, Prescribed Burning, Public or Commercial Removal of Wood Products within ¼ mile of Roads	136
Satisfactory	Severe	Hand Thinning or limited Mechanical and Mastication, Prescribed Burning, Commercial Removal within ¼ mile of Roads, with rehabilitation of soils.	670
Impaired	Slight/ Moderate	Mechanical or Hand Thinning, Mastication, Prescribed Burning, Commercial Removal within ¼ mile of Roads	57,670
Impaired	Severe	No Impaired/Severe Soil Types exist within Project Area	0
Unsatisfactory	Slight/ Moderate	No Unsatisfactory/Slight/Moderate Soil Types exist within Project Area	0
Unsatisfactory	Severe	Hand Thin only, Prescribed Burning, No Removal of Wood Products	22,501

Restoration activities proposed for the Puerco Landscape Restoration Project include:

- Commercially thin trees, including public fuelwood removal, and/or implement prescribed fire on approximately 31,440 acres.
- Implement prescribed fire alone on approximately 8,300 acres.
- Hand or mechanically thin and lop and scatter slash for soil protection without prescribed fire on approximately 23,300 acres.
- Hand thin and implement prescribed fire on approximately 3,000 acres.
- Mechanically thin or masticate and implement prescribed fire on approximately 14,900 acres.
- Implement more intensive treatments on up to 5,900 acres of stands that are moderately to heavily infected with dwarf mistletoe.
- Mechanically thin and/or implement prescribed fire on up to 3,694 acres of Mexican spotted owl (MSO) protected activity centers (PACs), up to 1,346 acres of MSO recovery habitat, and approximately 3,248 acres (including 1,850 acres of dispersal PFAs) of northern goshawk post-fledging family areas (PFA).
- Rehabilitate up to 200 miles of unauthorized roads.
- Improve road drainage and crossings.
- Restore approximately 19 springs.
- Restore up to 250 acres of riparian areas including associated stream habitats for threatened, endangered, and sensitive aquatic species.
- Improve the function of streams and gullies.

Puerco Collaborative Forest Landscape Restoration Project
3. Environmental Consequences

- Construct protective barriers around springs, aspen, and willows as needed for protection of approximately 300 acres.

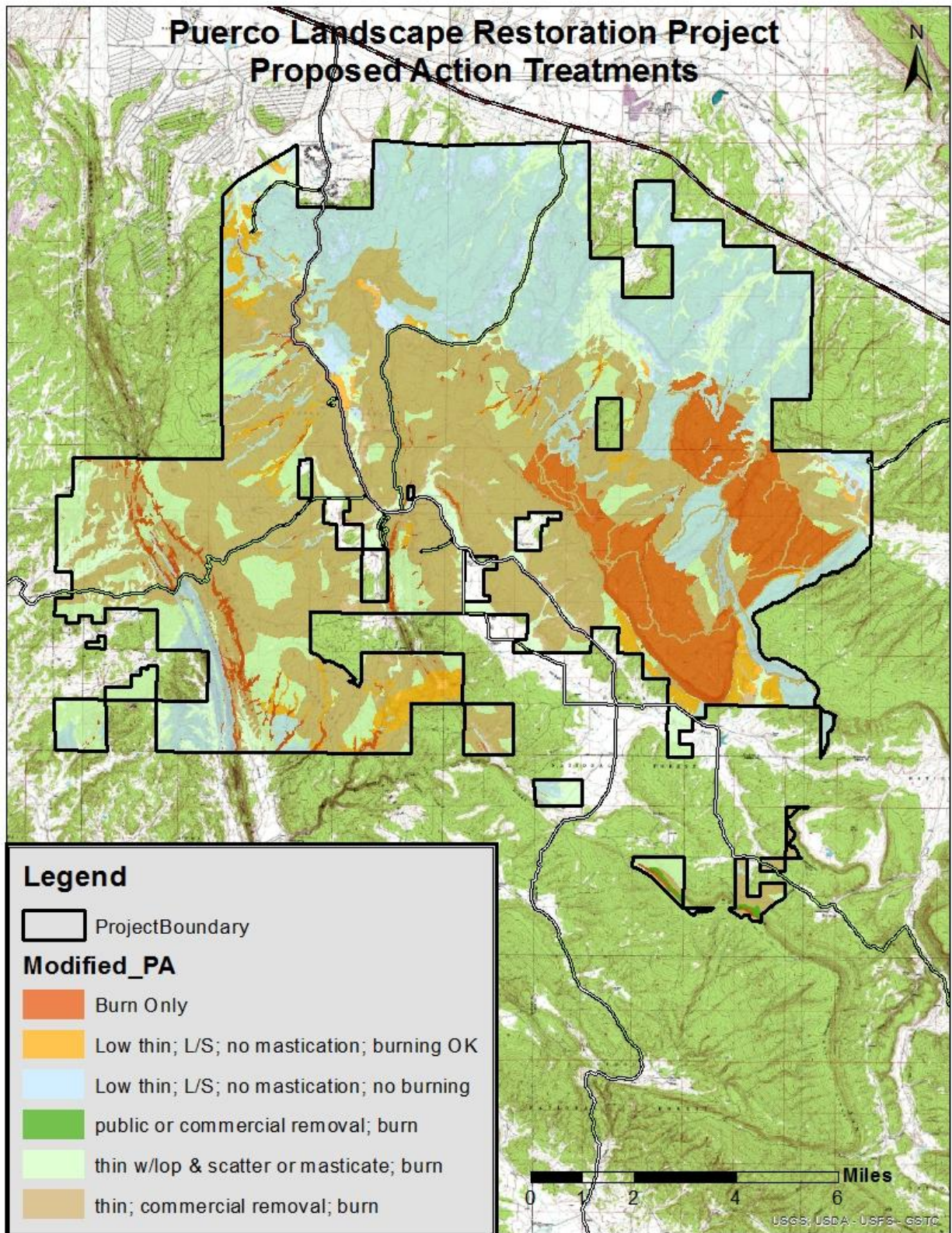
Table 2.2.2 displays acres proposed to be thinned and/or burned by existing forest cover type, and Figure 2.2.1 displays general locations for the proposed vegetation thinning and prescribed fire.

Table 2.2.2. Acres of Proposed Mechanical Treatments and Prescribed Fire by Cover Type

Vegetation Cover Type	Mechanical Treatment with Prescribed Fire	Mechanical Treatment Only	Prescribed Fire Only
Dry Mixed Conifer	263	300	212
Ponderosa Pine	19,423	2,068	3,481
Ponderosa Pine-Gambel Oak	10,908	1,073	3,045
Pinyon-juniper Woodland	875	17,444	225
Ponderosa Pine/P-J Transition	10,209	1,908	1,285
Grassland/Shrubland	7,671	534	33
Riparian Meadow	21	1	0
Totals:	49,369	23,328	8,281

- Rehabilitate up to 200 miles of unauthorized roads.
- Improve road drainage and crossings.
- Restore approximately 19 springs and reestablish or protect native plant species which currently exist or have been documented to exist in the area.
- Restore up to 250 acres of riparian areas including associated stream habitats for threatened, endangered, and sensitive aquatic species.
- Improve the function of streams, including gullies.
- Improve soil condition by improving ground cover and woody material.
- Construct protective barriers around springs, aspen, and willows as needed for protection of native plant species, stream bank integrity, and scenic value of approximately 300 acres.

Figure 2.2.1. General locations for the proposed vegetation thinning and prescribed fire.



Existing infrastructure including but not limited to water developments, fences, corrals and buildings would be inventoried and assessed to determine if their current location and design facilitate movement toward desired conditions. Alternative or additional locations or designs would be recommended where appropriate. Many water developments are not functional and are degrading the riparian ecosystems associated with them. Improved design and alternative water sources are needed to move toward desired conditions that increase water availability to wildlife and allow for better distribution of livestock to reduce overall impacts across the project area. To improve availability and distribution of water to benefit both range and wildlife species across the Puerco project, the following developments and improvements are proposed:

- Clean or reconstruct approximately 15 existing dirt tanks, and construct 2 new dirt tanks.
- Reconstruct approximately 15 miles of fence, and 1 corral.
- Install approximately 3 new cattle guards.
- Re-drill 3 existing wells and establish 3 new wells
- Install or extend 2 pipelines

Plan Amendments

To meet the project's purpose and need, the existing Cibola Forest Plan would need to be amended to provide for areas of grass, forbs, and shrubs interspersed with tree groups and allow for treatments to move tree group patterns, interspaces, and stand density toward the natural range of variability. Amending the forest plan would allow for treatments that improve Mexican spotted owl nesting and roosting habitat as defined in the Revised 2012 Mexican spotted owl recovery plan. Amendment(s) to the Cibola Forest Plan would provide consistency in meeting desired conditions for ponderosa pine, ponderosa pine – Gambel oak and mixed conifer forest types across the Puerco Project area (Appendix A).

In 2012 the Mexican Spotted Owl Recovery Plan, First Revision was published (USFWS 2012). There is a need for the project activities to be in alignment with the management direction provided in the revised recovery plan. A project-specific plan amendment is needed because the 1985 Cibola National Forest Plan, as amended, includes direction from the former (1995) recovery plan. In order to be consistent with the current recovery plan, the proposed plan amendment would:

- Update definitions and direction for protected (protected activity centers (PACs)), recovery habitat, and other forest and woodland types.
- Update language and direction related to prescribed cutting and fire treatments in PACs.
- Add forest structure guidelines for recovery habitat.
- Add direction for riparian forest habitats.
- Update survey information.

- Remove the direction for treating habitat in incremental percentages.

There is a need for the project activities to be in alignment with the best available science for northern goshawk management, particularly with regard to interspaces. Recent science (Reynolds et al. 2013) has shown that frequent-fire forests were historically characterized by the presence of interspaces of variable sizes and shapes. Interspaces are areas between tree groups which are generally composed of grass-forb-shrub vegetation and may contain scattered individual trees. The Cibola National Forest Plan provides guidelines to manage for uneven-aged stand conditions, but does not provide guidelines for the management of interspaces at the fine-scale. In order to meet restoration objectives there is a need for a project-specific Forest Plan amendment to address the management of habitat for northern goshawk, particularly regarding interspaces.

The Forest Plan provides direction for frequent-fire forest types on three levels: management scale, outside goshawk post-fledgling areas, and within goshawk post-fledgling areas. Therefore a project-specific Forest Plan amendment would need to address the direction provided on all three levels (Appendix A). The plan amendment would:

- Replace Forest Plan standards and guidelines for ponderosa pine and dry mixed-conifer (including northern goshawk direction) with desired conditions and guidelines.
- Add a desired condition for the percentage of interspaces within uneven-aged stands to facilitate restoration.
- Add the desired interspace distance between tree groups.
- Add a description of how canopy cover would be measured across the landscape.

Vegetation Treatments

Mixed Conifer Treatments

Dry mixed-conifer forests would be managed for shade-intolerant trees such as ponderosa pine, Douglas-fir, Southwestern white pine, quaking aspen, and other hardwoods at densities that would have been maintained under an uninterrupted frequent low-severity (Fire Regime 1) and infrequent mixed-severity (Fire Regime 3) schedule. Groups of reserve trees would be created in irregularly shaped groups that are variably spaced, with group sizes generally ranging from a few trees up to about an acre in size. Interspaces would be created where natural openings have become ingrown or from overstocked mid-aged trees.

Trees within groups may be of similar or variable ages and groups would be composed of one or more species of the best available dominant or codominant trees. Crowns of trees within the mid-aged to old groups (approximately 80 years old and greater) would be interlocking or nearly interlocking. Treated stands would be managed for an uneven-aged forest structure with an approximate balance of age classes ranging from young to old. Where established seedlings and

saplings are lacking, temporary openings would be created to encourage natural regeneration. Overall the proposed treatments would include:

- Creation of tree groups that are typically less than 1 acre in size, but most commonly range from 0.1 - 0.5 acres with 2-50 trees per group.
- Tree density may range from 20-100 trees per acre and 30-120 ft² of basal area per acre. Some natural openings may contain individual trees or snags.
- Creation of temporary openings on approximately 10-20% of the area, for regeneration purposes, up to two acres in size with a maximum width of 200 feet. Three to five seed trees would be retained where openings exceed 1 acre in size.
- Retention of snags (2/acre), large downed logs (3/acre), and woody debris levels (5-7 tons/acre)
- Interspaces surrounding tree groups are variably-shaped and comprised of a grass/forb/shrub mix. The size and arrangement of grass-forb-shrub interspaces would reflect local site conditions and may be as wide as 1-2 mature tree heights from the nearest drip lines of adjacent tree groups.
- Openness typically ranges from 10 percent in more productive sites to 50 percent in the less productive sites.
- Managing for old age trees such that as much old forest structure as possible is sustained over time across the landscape. Retention of all trees 18" DBH and greater that have no sign of insect or disease damage. All trees 24" diameter at breast height (DBH) and greater, regardless of health or condition.

On a minimum of 25% of the 775 acres of mixed conifer (approximately 194 acres), manage for Recovery Nest-Roost minimum desired conditions of:

- 30% of basal area in trees 12-18" DBH
- 30% of basal area in trees 18"+ DBH
- 120 square feet of basal area per acre
- Twelve 18"+ trees per acre.

The acres managed for Recovery Nest-Roost will meet the LRMP Forest Wide Standards and Guidelines, page 66, Table "The Minimum Criteria for the Structural Attribute Used to Determine Old Growth". Where these attributes are not currently present, those stands most closely resembling recovery nest-roost conditions will be managed to maintain and achieve them in the shortest possible amount of time.

Ponderosa Pine Treatments

Ponderosa Pine: Ponderosa pine forests would be managed for ponderosa pine, with incidental Douglas-fir, Southwestern white pine, quaking aspen, and other hardwoods. Within the ponderosa pine forest type the desired condition would be to provide goshawk habitat that is

consistent with the northern goshawk guidelines (Cibola Land and Resources Management Plan (LRMP), page 71-5; Management Recommendations for the Northern Goshawk in the Southwestern United States, General Technical Report RM-217. 1992).

Ponderosa pine forests would be managed for uneven-aged stand conditions to include irregularly shaped tree groups, interspaces and regeneration openings. A mosaic of stand densities, age classes, and canopy gaps would be created across the landscape. Where established seedlings and saplings are lacking, temporary openings would be created to encourage natural regeneration. Ground cover consists primarily of perennial grasses, forbs and shrubs capable of carrying surface fire, with basal vegetation values ranging between about 5 and 20% depending on the TEUI map unit (USDA Forest Service 1986, 2006). Overall the proposed treatments would include:

- Creation of tree groups typically less than 1 acre in size, but most commonly range from 0.1 - 0.5 acres. Tree density within treated areas would generally range from 22 to 89 ft² of basal area per acre (Reynolds et al. 2013).
- Creation of groups at the mid- to old-age stages consisting of 2 to approximately 40 trees per group, retaining all trees 24" diameter at breast height (DBH) and greater, regardless of health or condition.
- Creation of temporary openings, for regeneration purposes, up to four acres with a maximum width of 200 feet exist on approximately 10-20% of the area. Three to five seed trees per acre would be maintained in created openings larger 1 acre.
- Retention of snags (2/acre), large downed logs (3/acre), and woody debris levels (5-7 tons/acre)
- Maintaining a range of Vegetation Structural Stages ("VSS", or growth stages of living trees) - treatments would strive to achieve, over time, a VSS distribution of 10% VSS 1 (grasses, forbs, and shrubs); 10% VSS 2 (seedlings and saplings; 1"-4.9" DBH); 20% VSS 3 (young forest; 5"-11.9" DBH); 20% VSS 4 (mid-aged forest; 12"-17.9" DBH); 20% VSS 5 (mature forest; 18"-23.9" DBH); and 20% VSS 6 (old forest; 24"+ DBH) across the landscape.
- Goshawk nest areas would consist of, or be managed to attain, a minimum 30-40 TPA in a size class distribution of VSS 5 (18-23.9" DBH) and/or 6 (24"+ DBH).
- On 20% of the desired 24,971 acres of ponderosa pine acres (approximately 4,994 acres) the desired condition will be to develop and maintain old growth conditions as defined in the LRMP Forest Wide Standards and Guidelines, page 66, Table "The Minimum Criteria for the Structural Attribute Used to Determine Old Growth" These areas would be designated during the environmental analysis process.

Forest conditions in goshawk post-fledging family areas (PFAs) are similar to general forest conditions except these forests contain 10 to 20 percent higher basal area in mid- to old-age tree groups than in goshawk foraging areas and the general forest. Goshawk nest areas have forest conditions that are multi-aged but are dominated by large trees with relatively denser canopies than other areas in the ponderosa pine type.

There are approximately 5,900 acres of the ponderosa pine type that are moderately to heavily-infected with dwarf mistletoe, where greater than 20% of the host trees or 25% of the area is infected. If management goals are to retain the host species (ponderosa pine and Douglas-fir) on the site, even-aged prescriptions are recommended (Conklin & Fairweather 2010). During project layout, if field validation shows that mistletoe infection levels are so severe that an uneven-aged prescription would not move stands toward conditions, then an intermediate thinning would be prescribed and regeneration would not an objective until maturity or beyond.

Even-aged prescriptions (intermediate thinning) would generally focus on retaining the best dominant and codominant trees with the least amount of mistletoe. Improved growth and vigor of the best trees is a primary objective. Intermediate thinning would hasten the development of larger trees—including larger infected trees often now deficient on the landscape (Conklin & Fairweather 2010). Eventually, some proportion of these stands could be regenerated and replaced and then, over time, converted to an uneven-age condition.

Ponderosa Pine – Gambel Oak: This forest type would be treated similar to ponderosa pine, but additional emphasis placed on retaining and promoting the growth of additional large hardwoods (>5" diameter at root collar (drc)), retention of ponderosa pine greater than 18" DBH, and retention large snags (>18" DBH) and downed logs (>18" DBH). Manage for at least 10% of total stand basal area (ft²) consisting of Gambel oak 5" DRC or greater, or 20 ft² of basal area per acre of Gambel oak. On 20% of the desired 15,025 acres of ponderosa pine – Gambel oak (approximately 3,005 acres) the desired condition will be to develop and maintain old growth conditions as defined in the LRMP Forest Wide Standards and Guidelines, page 66, Table "The Minimum Criteria for the Structural Attribute Used to Determine Old Growth" These areas would be designated during the environmental analysis process. Retain all trees 18" DBH and greater, per Mexican Spotted Owl recovery Plan (2012).

There are approximately 2,165 acres of the ponderosa pine type that are moderately to heavily-infected with dwarf mistletoe, where greater than 20% of the host trees or 25% of the area is infected. If management goals are to retain the host species (ponderosa pine and Douglas-fir) on the site, even-aged prescriptions are recommended (Conklin & Fairweather 2010). During project layout, if field validation shows that mistletoe infection levels are so severe that an uneven-aged prescription would not move stands toward conditions, then an intermediate thinning would be prescribed and regeneration would not an objective until maturity or beyond.

On a minimum of 10% of the 15,025 acres of desired pine-oak type (approximately 1,503 acres), manage for MSO Recovery Nest-Roost minimum desired conditions of:

- 30% of basal area in trees 12-18" DBH
- 30% of basal area in trees 18"+ DBH
- 110 square feet of basal area per acre

- Twelve 18”+ trees per acre.

Mixed Ponderosa Pine & Pinyon-Juniper Transition Treatments

These transition zones include a variable tree component that may range from sparse to relatively dense and may include any of the pinyon and juniper species, ponderosa pine and oak. It is desired to maintain uneven-aged conditions and sustain a mosaic of vegetation densities (overstory and understory), age classes, and species composition well distributed across the landscape. Overstory vegetation in trees ranges from about 15-50%, and ground cover consists of shrubs, perennial grasses, and forbs with basal vegetation values ranging between about 5 and 20% depending on the TEUI unit (USDA Forest Service 1986). Trees occur in even-aged patches ranging from young to old, where patch size of these woodlands ranges from 10s to 100s of acres (Muldavin et al. 2003). Retention of ponderosa pine will focus on the most vigorous and healthy dominant and co-dominant trees in irregularly sized-groups and stringers, while removing mid-story ladder fuels. Where pinyon-juniper dominates, focus will be on thinning from below and restoring historic openings between tree groups.

Ponderosa Pine dominated: Tree density within ponderosa pine dominated areas generally ranges from 22 to 89 square foot basal area per acre (Reynolds et al. 2013). Size of tree groups typically is less than 1 acre, but averages 0.25 acres. Groups at the mid- to old-age stages consist of 2 to approximately 40 trees per group. Pinyon pine and juniper species would be maintained as a minor component of the mid-story, focusing on retention of the largest and oldest trees. All trees 24” DBH and greater, regardless of health or condition, will be retained.

There are approximately 600 acres of the mixed ponderosa pine & pinyon-juniper transition type that are moderately to heavily-infected with dwarf mistletoe, where greater than 20% of the host trees or 25% of the area is infected. If management goals are to retain the host species (ponderosa pine and Douglas-fir) on the site, even-aged prescriptions are recommended (Conklin & Fairweather 2010). During project layout, if field validation shows that mistletoe infection levels are so severe that an uneven-aged prescription would not move stands toward conditions, then an intermediate thinning would be prescribed and regeneration would not an objective until maturity or beyond.

P-J Woodland Dominated: In areas dominated by P-J Woodland, trees occur as individuals or in smaller groups ranging from young to old. Typically groups are even-aged in structure with all ages represented across the landscape for an overall uneven-aged grouped appearance. Patch sizes of woodlands range from individual trees and clumps that are less than one-tenth acre, to tree groups of approximately an acre, and occasionally from 1 to 10’s of acres. Retention of ponderosa pine would focus on the oldest, most vigorous and healthy dominant and co-dominant trees in irregularly sized-groups and stringers

- On 20% of the desired 13,403 acres of Ponderosa Pine / P-J Mix (approximately 2,681 acres) the desired condition will be to develop and maintain old growth conditions as defined in the

LRMP Forest Wide Standards and Guidelines, page 66, Table “The Minimum Criteria for the Structural Attribute Used to Determine Old Growth” These areas would be designated during the environmental analysis process.

Pinyon – Juniper Woodland:

The pinyon-juniper (P-J) vegetation community in the Puerco Project is primarily composed of P-J Woodland, with a small amount of P-J Grass. These are dominated by one or more species of pinyon pine and/or juniper and can occur with a grass/forb dominated understory (P-J grassland), or a discontinuous understory of some grasses and/or shrubs (P-J Woodland). Two-needle pinyon pine and One-seed juniper are common. Rocky Mountain and alligator junipers are well-represented, with a lesser abundance of oaks. Species composition and stand structure vary by location primarily due to precipitation, elevation, temperature, and soil type.

On 20% of 18,545 P-J acres (approximately 3,709 acres) the desired condition will be to develop and maintain old growth conditions as defined in the LRMP Forest Wide Standards and Guidelines found on page 66, Table “The Minimum Criteria for the Structural Attribute Used to Determine Old Growth” These areas would be designated during the environmental analysis process.

P-J Woodland - trees occur as individuals or in smaller groups ranging from young to old. Typically groups are even-aged in structure with all ages represented across the landscape for an overall uneven-aged grouped appearance. The patch size of woodlands ranges from 1 to 10s of acres.

P-J Grass (Savanna) - is generally uneven aged and open in appearance. Trees occur as individuals, but occasionally in smaller groups, and range from young to old. Patch sizes of woodlands range from individual trees and clumps that are less than one-tenth acre, to tree groups of approximately an acre (Muldavin et al. 2003).

Grasslands/Shrublands:

Approximately 8,237 acres of grassland and shrubland types, based on TEUI, would be moved toward the following desired conditions:

Sagebrush Shrubland – Historically dominated by big sagebrush and primarily occurs adjacent to Great Basin grassland and pinyon juniper woodlands. While big sagebrush is the dominant species, other shrubs and grasses and forbs are present. Historically, tree canopy cover exceeded 10%, with the exception of early, post-fire plant communities (USDA 2015). The historic average fire return interval was 35–200 years from mixed-severity fire. Sagebrush shrubland is highly departed for vegetation structure, species composition, and patch size (too small), ecological need for change may hinge on restoring the historic mixed-severity fire regime.

Colorado Plateau/Great Basin Grassland - In general, found at lower elevations with vegetation coverage consisting of mostly grasses and interspersed shrubs. May have had over 10% shrub cover historically, but had less than 10% tree cover. The historic average fire

return interval was 0–35 years from stand-replacing fire; however, most recent fires have been non-lethal. Departure is moderate with moderate–high risk from vegetation structure, high risk from altered fire regime, and high risk from decreased patch size, future management should strive to restore vegetation structure to reference conditions. In turn, this may simultaneously (either passively or actively) return fire regime and patch size to reference conditions (USDA 2015).

Montane/Subalpine Grassland - Occurs at elevations ranging from 8,000-11,000 feet, and often harbors several plant associations with varying dominant grasses and herbaceous species. Trees may occur along the periphery of the meadows, and some shrubs may also be present. These meadows are seasonally wet, which is closely tied to snowmelt. They typically do not experience flooding events. Historically, tree and shrub canopy cover were each less than 10% and stand-replacing fires occurred every 0–35 years. The most substantial risks are from a lack of frequent stand-replacing fire and patch size (currently highly departed; too small). May be considered especially sensitive to climate change, as it occurs at the highest elevations and is therefore incapable of uphill migration as a climate change response. Future management should use stand-replacing fire to reduce tree encroachment, increase patch size, and potentially restore species composition.

Areas Over 40% Slope

Dispersed throughout the project area is approximately 3,791 acres over 40% slope. These areas would not be treated mechanically, but could be treated by hand (chainsaw) or prescribe burned as allowed by the Cibola LRMP or recovery plan(s). Tree densities would be reduced by thinning and disposing of designated trees on site through prescribed burning or exclusively by prescribed burning.

The following table describes proposed treatments to meet the desired condition for each Forest Type based on soil conditions, location and slope:

Puerco Collaborative Forest Landscape Restoration Project
3. Environmental Consequences

Table 2.2.3. Proposed Vegetation Treatments and Treatment Types

Product/ Non- Product Removal Area	Treatment Type	Cutting Methods How will excess trees be cut or otherwise handled?	Tree Removal Will cut trees be removed from the areas?	Slash Treatment What happens to tree tops and other material that remains on the site after cutting?
Product Removal Area: Public and/or Commercial Removal of forest products	1 – Satisfactory soils with Slight/Moderate Erosion Hazard Rating on less than 40% slope: within 0.25 mile along national forest system (NFS) roads, NFS trails, or unauthorized roads. Approx. acres = 89.	Mechanical mastication Chainsaws – contract or Forest Service Mechanized feller, public	None where mastication occurs. Commercial fuelwood, service contracts and/or timber sale contracts. Where good access exists, material removed under permits for personal use firewood	Masticated material would be spread on site to a depth of 0"-4", other cut material lopped and scattered to a depth of 18" max. Hand piles may be created where needed and piles will not exceed 10'x10' Broadcast burning and/or pile burning when management prescription conditions are met.
Product Removal Area: Commercial removal only	2 - Impaired soils with Slight/Moderate Erosion Hazard Rating and satisfactory soils with Severe Erosion Hazard Rating on less than 40% slope: within 0.25 mile along NFS roads, NFS trails, or unauthorized roads. Approx. acres = 36,899	Mechanical mastication Chainsaws – contract or Forest Service Mechanized feller	None where mastication occurs Commercial fuelwood, service contracts and/or timber sale contracts.	Masticated material would be spread on site to a depth of 0"-4", other cut material lopped and scattered to a depth of 18" max. Hand piles may be created where needed and piles will not exceed 10'x10' Broadcast burning and/or pile burning when management prescription conditions are met.
Non-Product Removal Area	3 – Satisfactory and Impaired soils inside & outside 0.25 mile along NFS roads, NFS trails, or unauthorized roads. Approx. acres 9,346.	Mechanical mastication, Chainsaws – contract or Forest Service Mechanized feller and/or prescribe burned only	None	Masticated material would be spread on site to a depth of 0"-4", other cut material will be lopped and scattered to a depth of 18" max. Hand piles may be created where needed and piles will not exceed 10'x10'. Broadcast burning and/or pile burning when management prescription conditions are met.

Puerco Collaborative Forest Landscape Restoration Project

3. Environmental Consequences

Non-Product Removal Area	4 – Areas with poor access and Unsatisfactory Soil Condition on less than 40% slopes outside Chinle Soil Formation. Approx. acres 8,280.	None - these areas would be prescribe burned only	None	Broadcast burning when management prescription conditions are met.
Non-Product Removal Area	5 – Areas with poor access regardless of Soil Condition or Erosion Hazard Rating. Approx. acres 3,034.	Chainsaws – contract or Forest Service and/or Prescribe burned only	None	Cut material will be lopped and scattered to a depth of 18" max. Hand piles may be created where needed and piles will not exceed 10'x10'. Broadcast burning and/or pile burning when management prescription conditions are met.
Non-Product Removal Area	6 – Chinle Formation and areas with Poor Access. Approx. acres 23,328.	Chainsaws – contract or Forest Service	None	Cut material will be lopped and scattered to a depth of 18" max. Hand piles may be created where needed and piles will not exceed 10'x10'.

Dollars generated from the sale of the harvested material and fuelwood permits would be retained by the Forest Service under authority in the Knutson-Vandenberg Act of 1930 (KV) for rehabilitation activities. The rehabilitation activities could include: 1) decommissioning of unauthorized roads within the project area by ripping compacted soils, installing erosion control features, seeding the impacted areas with native grasses and using slash to cover impacted corridors to up to 80% coverage, 2) rehabilitating cross country travel corridors by ripping compacted soils, installing erosion control features, seeding the impacted areas with native grasses and using slash to cover impacted corridors to up to 80% coverage, 3) hand piling slash where needed to provide for manageable prescribed fire conditions, 4) lopping and scattering slash not collected through fuelwood gathering to 18" maximum height, and 5) conducting thinning within the project area.

For location of treatment types as described in the table, refer to Puerco Landscape Restoration, Proposed Action w/ Vegetation Treatment Types and Implementation Phases, Figure 2.2.2.

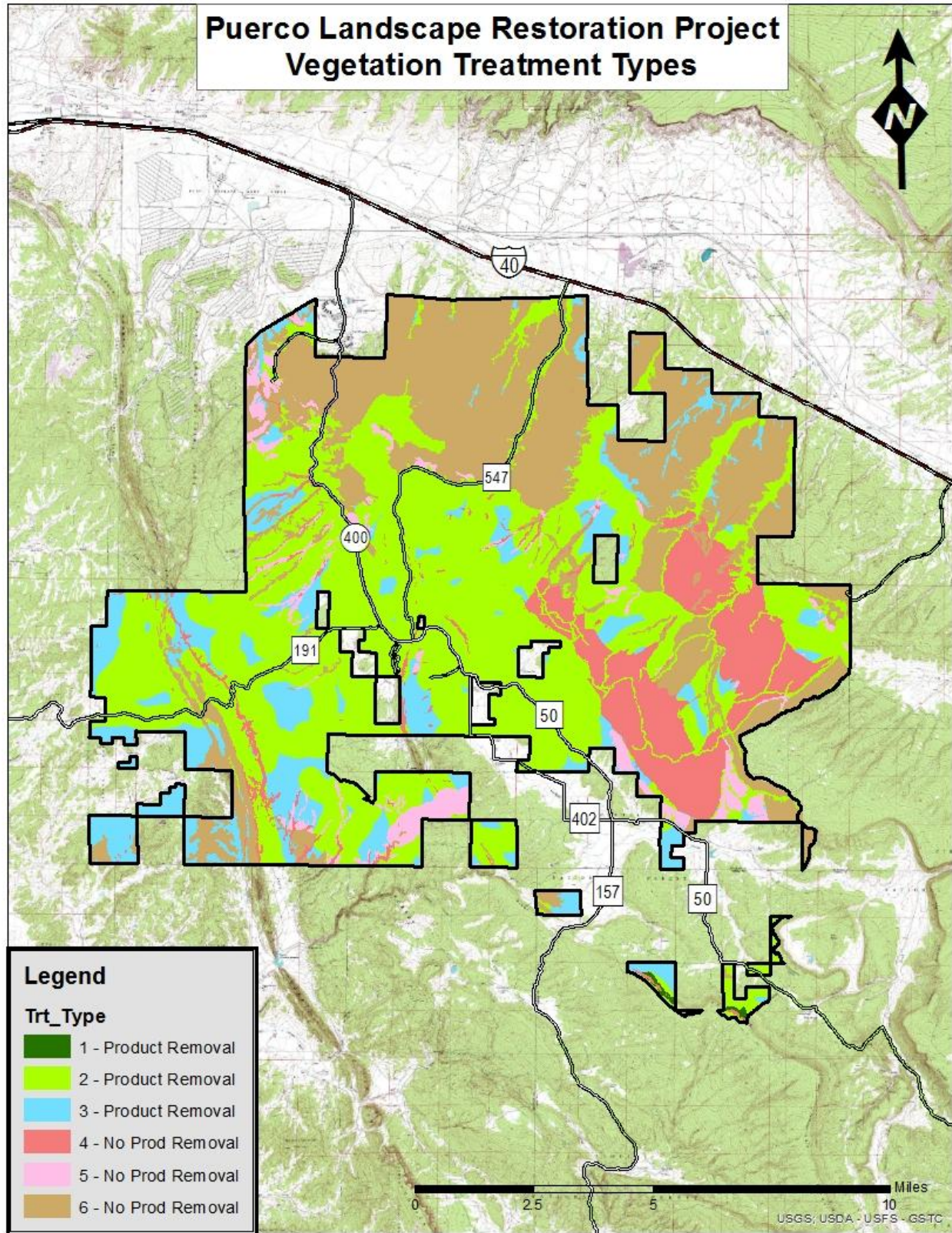


Figure 2.2.2. Vegetation Treatment Types

Slash Disposal

Activity fuel such as bole wood, tops and branches, hand piles, and mastication grindings would be treated as needed to meet fuels reduction and scenic quality objectives through prescribed burning and/or pile burning when conditions allow for safe and effective burning. All prescribed burning would comply with Cibola and McKinley County air quality regulations and will be approved through appropriate permitting processes.

Transportation and Wood Hauling

No new roads or temporary roads would be constructed for this project. All wood products generated from this project would be removed under permit using National Forest System (NFS) roads or trails or unauthorized roads and trails (see Figures 5A & 5B in Appendix C). Road decommissioning would be coordinated with the implementation phase approach. Figure 2.2.3 shows National Forest System roads and unauthorized roads identified during project planning.

Figure 2.2.3. System Roads and Unauthorized Roads.

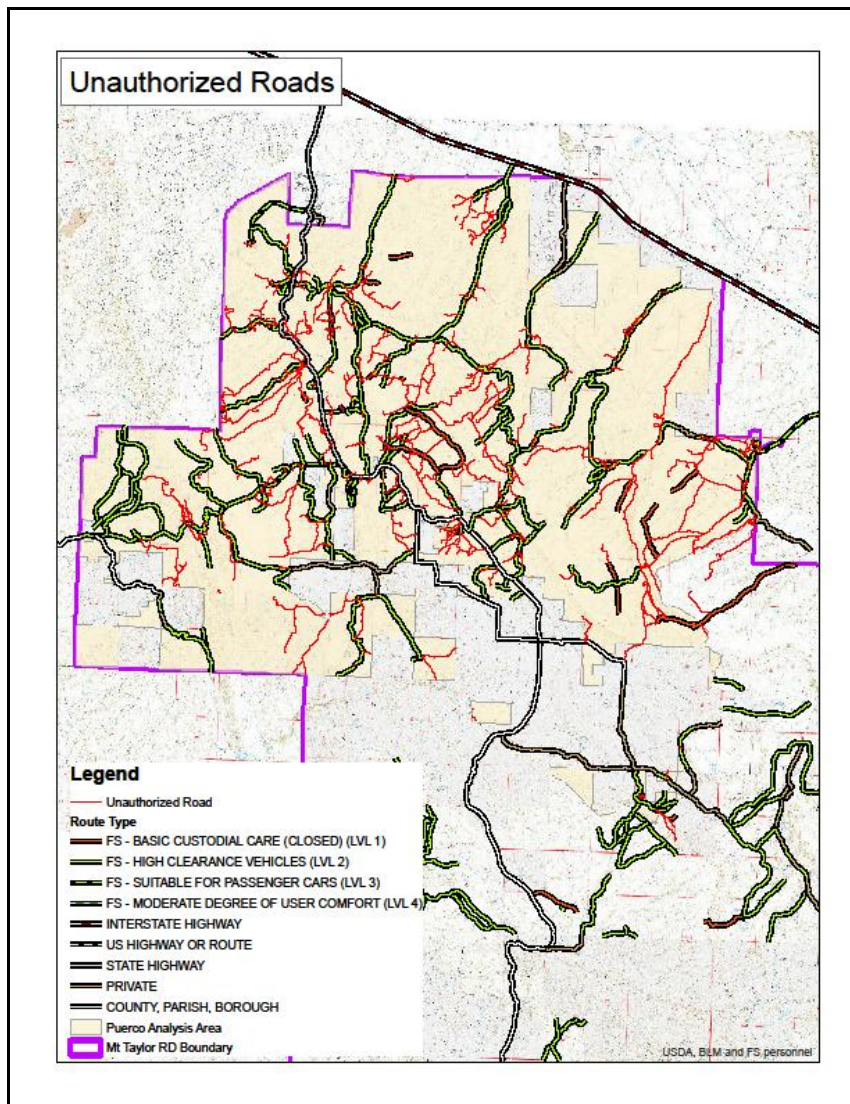


Table 2.2.4 shows the existing, as well as pre- and post-project, maintenance levels and the motor vehicle use designations for the potential haul routes. ML 1 roads used for project activities would be changed to ML 2 during implementation. When no longer needed for project activities, these roads would be returned to ML 1 status, unless they were designated for motor vehicle use under the 2011 Travel Management decision. All unauthorized road used for project activities would be decommissioned/rehabilitated when no longer needed, unless they were designated for motor vehicle use under the 2011 Travel Management decision.

Puerco Collaborative Forest Landscape Restoration Project
3. Environmental Consequences

Table 2.2.4. Potential Haul Routes

Road No.	BMP	EMP	Length (miles)	Current ML ⁸	During-Project ML	Post-Project ML ¹	Travel Management Designation
151	0.000	1.738	1.738	2	2	2	All Motor Vehicles ³
151AA	0.000	0.246	0.246	2	2	2	not designated ³
152	0.000	0.420	0.420	3	3	3	All Motor Vehicles ³
154	0.000	1.210	1.210	3	3	3	All Motor Vehicles
154A	0.000	0.295	0.295	3	3	3	All Motor Vehicles
154AA	0.000	0.340	0.340	3	3	3	All Motor Vehicles
154BB	0.000	2.555	2.555	2	2	2	not designated
154BC	0.000	0.168	0.168	2	2	2	not designated
154BD	0.000	2.038	2.038	2	2	2	not designated
156	0.000	0.780	0.780	3	3	3	All Motor Vehicles
156X	0.000	0.316	0.316	2	2	2	not designated
162	0.000	1.160	1.160	2	2	2	All Motor Vehicles ³
162B	0.000	0.147	0.147	2	2	2	not designated ³
162C	0.000	0.125	0.125	2	2	2	not designated ³
162D	0.000	0.363	0.363	2	2	2	not designated ³
164	0.000	6.863	6.863	2	2	2	All Motor Vehicles ³
164A	0.000	2.940	2.940	U	2	2	All Motor Vehicles ^{9,10}
164C	0.000	3.465	3.465	2	2	2	All Motor Vehicles ³
164C	3.465	6.235	2.770	2	2	2	not designated ³
164CB	0.000	0.448	0.448	U	2	2	All Motor Vehicles ^{2,3}
164CD	0.000	4.259	4.259	2	2	2	All Motor Vehicles ³
164CDA	0.000	0.321	0.321	2	2	2	All Motor Vehicles ³
164CDA	0.321	2.200	1.879	2	2	2	not designated ³
164CDAA	0.000	0.449	0.449	2	2	2	All Motor Vehicles ³
164CDAA	0.449	0.823	0.374	2	2	2	not designated ³
164E	0.000	1.182	1.182	2	2	2	not designated ³
164H	0.000	2.074	2.074	2	2	2	not designated
164H	2.397	2.508	0.111	2	2	2	not designated ³
164H	2.508	5.520	3.012	2	2	2	All Motor Vehicles ^{3,11}
164HA	0.000	0.936	0.936	U	2	2	All Motor Vehicles ^{2,3}
164HAX	0.000	0.296	0.296	2	2	2	All Motor Vehicles ³
164HAX	0.296	0.621	0.325	2	2	2	not designated ³
164HB	0.000	0.153	0.153	2	2	2	All Motor Vehicles ³
164HB	0.615	1.982	1.367	2	2	2	not designated ³

⁸ U – unauthorized roads (includes previously decommissioned roads).

⁹ Travel management designation pending archaeological clearance.

¹⁰ Wildlife seasonal closure area.

¹¹ Travel management designation pending archaeological clearance for another road needed for access.

Puerco Collaborative Forest Landscape Restoration Project
3. Environmental Consequences

164Q	0.000	0.960	0.960	2	2	2	All Motor Vehicles ³
165A	0.000	1.265	1.265	U	2	2	All Motor Vehicles ²
166	0.000	1.540	1.540	U	2	2	All Motor Vehicles ²
166	1.540	2.970	1.430	U	2	2	All Motor Vehicles ^{2,3}
166	6.315	8.200	1.885	U	2	2	All Motor Vehicles ^{2,3}
166B	0.000	1.008	1.008	U	2	2	All Motor Vehicles ^{2,3}
166B	1.008	1.787	0.779	U	2	2	All Motor Vehicles ^{2,3}
166BA	0.400	0.755	0.355	1	2	1	not designated ³
191	0.000	2.000	2.000	3	3	3	All Motor Vehicles
191	2.000	7.614	5.614	2	2	2	All Motor Vehicles
191B	0.000	0.032	0.032	2	2	2	All Motor Vehicles
191B	0.032	0.157	0.125	2	2	2	All Motor Vehicles ³
191B	0.157	0.816	0.659	2	2	2	not designated ³
191BA	0.000	0.111	0.111	2	2	2	not designated ³
191C	0.000	0.034	0.034	2	2	2	not designated
191C	0.034	0.618	0.584	2	2	2	not designated ³
191D	0.000	0.586	0.586	2	2	2	All Motor Vehicles
191D	1.156	2.517	1.361	2	2	2	All Motor Vehicles
191DX1	0.000	2.164	2.164	2	2	2	not designated
191DX3	0.000	0.572	0.572	2	2	2	not designated
191E	0.000	0.432	0.432	2	2	2	not designated
191F	0.000	2.065	2.065	2	2	2	All Motor Vehicles ³
191G	0.000	0.852	0.852	2	2	2	not designated
191I	0.000	0.032	0.032	2	2	2	not designated
191I	0.032	2.895	2.863	2	2	2	not designated ³
191J	0.000	0.930	0.930	2	2	2	All Motor Vehicles
191L	0.000	1.208	1.208	2	2	2	All Motor Vehicles
191N	0.000	0.285	0.285	2	2	2	not designated
191O	0.000	3.453	3.453	2	2	2	All Motor Vehicles
191OA	0.000	2.901	2.901	2	2	2	All Motor Vehicles
191OB	0.000	0.286	0.286	2	2	2	not designated
191OB1	0.000	1.399	1.399	2	2	2	All Motor Vehicles
191OC	0.000	0.341	0.341	2	2	2	not designated
4000D	0.000	0.303	0.303	2	2	2	not designated
400A1	0.000	0.658	0.658	2	2	2	not designated ³
400AB	0.000	0.608	0.608	2	2	2	not designated ³
400C	0.000	2.499	2.499	2	2	2	All Motor Vehicles ³
400CB	0.000	0.300	0.300	2	2	2	not designated ³
400CG	0.000	2.384	2.384	2	2	2	not designated ³
400CH	0.000	3.550	3.550	2	2	2	not designated ³
400CHBA	0.000	0.354	0.354	1	2	1	not designated ³
400CJ	0.000	0.728	0.728	2	2	2	not designated ³
400CK	0.000	0.555	0.555	2	2	2	not designated ³

Puerco Collaborative Forest Landscape Restoration Project
3. Environmental Consequences

402	0.000	0.044	0.044	3	3	3	All Motor Vehicles
402	1.047	1.713	0.666	3	3	3	All Motor Vehicles
402	2.698	3.178	0.480	3	3	3	All Motor Vehicles
402A	0.000	1.250	1.250	2	2	2	not designated
418	0.000	1.325	1.325	1	2	1	All Motor Vehicles
464	0.000	3.800	3.800	3	3	3	All Motor Vehicles
465	0.000	2.156	2.156	2	2	2	All Motor Vehicles ³
465	2.719	3.477	0.758	2	2	2	not designated ³
465A	0.000	0.720	0.700	2	2	2	not designated ³
465A	0.720	1.216	0.496	2	2	2	All Motor Vehicles
465AA	0.000	2.272	2.272	U	2	2	All Motor Vehicles ^{2,3}
465AB	0.000	1.68	1.680	U	2	2	All Motor Vehicles ^{2,3}
465AC	0.000	0.620	0.620	2	2	2	not designated ³
481	0.000	2.571	2.571	2	2	2	All Motor Vehicles ³
494	0.000	2.521	2.521	2	2	2	All Motor Vehicles
494	5.342	5.813	0.471	2	2	2	not designated
494	5.813	5.951	0.138	2	2	2	All Motor Vehicles
494A	0.000	0.850	0.850	2	2	2	not designated
494B	0.666	0.766	0.100	2	2	2	not designated
496	0.000	2.500	2.500	2	2	2	All Motor Vehicles ³
496A	0.000	2.690	2.690	1	2	1	Motorized Trail ³
496A	2.690	3.970	1.280	2	2	2	not designated ³
496B	0.000	0.689	0.689	1	2	1	Motorized Trail ³
496B	0.689	1.550	0.861	1	2	1	Motorized Trail ^{2,3}
496CB	0.000	0.928	0.928	2	2	2	not designated ³
496D	0.000	1.827	1.827	U	2	2	All Motor Vehicles ^{2,3}
496DB	0.000	1.323	1.323	2	2	2	not designated ³
496DC	0.000	0.288	0.288	2	2	2	All Motor Vehicles ³
496DD	0.000	0.672	0.672	2	2	2	not designated ³
50	15.732	30.575	14.843	2	2	2	All Motor Vehicles ¹²
50A	0.000	0.337	0.337	2	2	2	not designated
50C	0.000	0.936	0.936	2	2	2	not designated
50D	0.000	0.310	0.310	2	2	2	not designated
50DA	0.000	0.360	0.360	2	2	2	not designated
50G	0.000	0.530	0.530	2	2	2	not designated
50GA	0.000	0.114	0.114	2	2	2	not designated
50I	0.000	1.200	1.200	2	2	2	not designated
50IA	0.000	0.236	0.236	2	2	2	not designated
50IC	0.000	1.100	1.100	2	2	2	not designated
50ICA	0.000	0.500	0.500	2	2	2	not designated
50ICB	0.000	0.500	0.500	2	2	2	not designated

¹² Segments under Forest Service jurisdiction are designated for motor vehicle use.

Puerco Collaborative Forest Landscape Restoration Project
3. Environmental Consequences

50J	0.710	1.900	1.190	2	2	2	not designated
503	0.000	1.750	1.750	2	2	2	All Motor Vehicles ³
503A	0.000	2.220	2.220	2	2	2	All Motor Vehicles ³
503B	0.000	0.800	0.800	2	2	2	not designated ³
503BX	0.000	0.560	0.560	2	2	2	not designated ³
503X	0.000	1.743	1.743	U	2	2	All Motor Vehicles ^{2,3}
503Z	0.000	2.430	2.430	2	2	2	All Motor Vehicles ^{3,4}
503ZD	0.000	0.520	0.520	1	2	1	not designated ³
547	0.000	0.360	0.360	2	2	2	All Motor Vehicles
547	0.360	9.740	9.380	2	2	2	All Motor Vehicles ³
547	9.740	10.001	0.261	2	2	2	All Motor Vehicles
2020	0.000	1.822	1.822	U	2	2	All Motor Vehicles ^{2,3}
2021	0.000	2.426	2.426	U	2	2	All Motor Vehicles ^{2,3}

In addition to the National Forest System roads listed above there are approximately 200 miles of GPSed non-system roads within the project area that could be used to facilitate access for forest/grassland restoration treatments, wood removal and as prescribed burn control lines. During the project these roads may receive maintenance work to mitigate resource damage and provide for safe use. Once these roads are no longer needed to implement the fuels reduction work they will be decommissioned by obliterating the roadbed by ripping compacted soils, installing erosion control features, seeding the impacted areas with native grasses and using slash to cover impacted corridors. A portion of this work could be accomplished using KV receipts generated from the sale of the woody material and/or Forest Service appropriated funds. The road decommissioning would improve watershed conditions and wildlife habitat while making portions of the project less accessible for illegal wood collection and illegal game retrieval. Refer to Figure 2 in Appendix C for locations of roads described above and haul route table for pre and post treatment status.

Recreation Management

Alternative B proposes the following recreation management activities:

1. Thin trees within developed recreation sites while maintaining screening in order to establish and maintain uneven-age managed stands, reduce overhead hazards, and reduce hazardous fuel loading in and around sites.
2. Smaller trees will be left between picnic/camping sites to create a screen, giving users privacy while enjoying the facilities. The majority of the wood cut from the recreation sites would be removed as fuel wood or timber sale. Quaking Aspen and McGaffey Campgrounds may be closed during thinning operations to ensure the safety of the public, which would most likely take place between August and March.

2.3 Design Criteria Common to Action Alternatives

Vegetation Restoration

- Retain native deciduous species (oak, mountain mahogany, box elder, etc) 10 inches DRC and larger. Species less than 10 inches DRC would be retained within groups where retention would not compromise treatment objectives.
- Retain mature (flattened crowns, red/yellow plated bark on more the half the length of the bole, little taper) ponderosa pine, regardless of size, and all timber species larger than 24" DBH.
- Ips Beetles – Minimize creation of activity slash before July or unless the potential for Ips infestation is determined to be low. Avoid creating activity slash in the same area multiple years. Remove as much woody material 3-inches or more in diameter from the site as possible. Promptly treat slash through lop/scatter, chipping/mastication, hand pile burning or prescribed burning.
- Do not allow concentrations of chipped/masticated material to accumulate over 4 inches in depth over large areas, or lie immediately adjacent to live standing trees. Distribute chipped/masticated materials in open areas or on slopes where they would dry quickly. Don't consider burning of woody material to be an effective treatment for Pinyon Ips unless accomplished before beetles emerge from the woody material. Avoid mechanical damage to residual trees and their root systems to reduce risk of attracting bark beetles. Monitor slash during and after treatment for Ips beetle infestation. If found, contact Forest Silviculturist or Forest Health Protection Entomologist.

Scenic and Recreation Resources

- Project activities should avoid even spacing of retained trees, and instead leave a diversity of tree species, sizes, and ages, avoid damage to vegetation that will remain, and naturalize disturbed areas.
- Prescribed slash treatment in the immediate foreground (up to 300 feet) of concern level 1 and 2 travelways and recreation sites (areas with the most public concern for scenery) should be completed as soon as conditions permit.
- Mark trees that are to be removed on the backs of trunks, away from the primary viewing point (i.e. from roads and trails).
- In the immediate foreground along concern level 1 and 2 travelways and recreation sites, stumps should be treated to reduce their visibility by methods such as cutting as low as possible (no more than 6 inches above ground on uphill and downhill side) and angling large stump faces away from viewing locations unless doing so would pose a safety hazard.
- Effects from prescribed fire should be considered during project planning and implementation. For example: (1) blackened and scorched vegetation may be visible in project areas in the short term following treatments, but desired conditions for scenery and visual resources should be met in the long term, and (2) efforts should be made to minimize high-intensity fire in riparian areas along system trails and scenic vistas.
- Log decks should be removed and rehabilitated, and skid trails should be naturalized.

- National Forest System trails should not be used for vegetation project activities such as for landings and as skid trails. Impacts to system trails should be avoided and mitigated upon project completion if unavoidable. If trails are impacted, crossings are only at perpendicular angles and crossings are rehabilitated after project completion, using barriers or other rehabilitation measures to discourage future use.
 - ♦ Avoid using trails as treatment unit boundaries especially for mechanical treatments for Concern Level 1 trails.
- Provide public notice and information about treatment locations, timing and the type of treatment occurring prior to and during vegetation and fire treatments.
- Treatments extend up to the edges of the trail concern level 1 and 2 trails and recreation sites, and do not leave a screen of trees. Groups of trees complying with the prescribed treatment are left that visually connect with the treatment unit's edge, to avoid an abrupt and noticeable change.
- Where meadows are not being restored, “feather” treatment edges along the trail from more to fewer trees as treatments move away from the trail. Edges of treatment units will be shaped as described below to avoid abrupt changes between treated and untreated areas. Edges will be natural-appearing, feathered, and will blend with general surroundings. Feathering refers to softening treatment edges by thinning in the following manner:
 - ♦ Where the treatment unit is adjacent to denser forest (treated or untreated), the percent of thinning within the transition zone is progressively reduced toward the denser edges of the unit. Similarly, where the treatment unit interfaces with an opening (including savannah and grassland treatments, and natural openings) the transition zone is progressively increased toward the open edges of the unit.
 - ♦ Treatment extends up to the edges and does not leave a screen of trees. Groups of trees complying with the prescribed treatment are left that visually connect with the unit's edge, to avoid an abrupt and noticeable change.
- Healthy large trees should comprise the majority of the immediate foreground along designated travelways unless doing so would not achieve project goals; some younger and mid-aged trees are retained to serve as replacement trees and as additional screening.
- Depth of masticated material not to exceed 4” along Concern Level 1 travelways and recreation sites
- Landings shall not be located within 600-foot-wide corridor (300-foot on either side of developed recreation sites or Concern Level 1 travelways.
- Mark trees that are to be removed on the backs of trunks, away from the primary viewing point (i.e. from Level 1 travelways and trails).
- Minimize and avoid the placement of log decks, temporary roads, and skid trails within and adjacent to sensitive viewsheds, Concern Level 1 travelways, developed recreation sites, and private homes/communities.
- Reseed and mulch decks as soon as possible to speed recovery, with high priority along Concern Level 1 travelways, trails, and developed recreation sites.

- Skid trail crossings may cross designated trails, but will be kept to a minimum. Any crossings will be perpendicular to the designated system trail.
- If trails are used as skid trails, trail clean up and rehabilitation will be included in the contract. This should include restoring the trail to its original trail width.
- Changes to trail alignment and surfacing will be minimized; the trail will not be straightened nor its surface changed with an alternate material unless such actions are approved by the District Recreation Staff and are needed to enhance the trail and protect resources.
- Cull logs will not be abandoned on landings, and should be used for rehabilitating skid trails, closing user created roads or decommissioning roads.
- Cull logs may also be suitable to use as down woody material, but should be scattered away from the landings.
- Stump heights should be cut as low as possible within the foreground (300 feet from centerline of roads, trails, or edge of recreation sites) of Concern Level 1 roads and trails, with the cut angled away from the viewer in these areas.
- Locate slash piles and landings 300' feet from edge of high sensitivity roads and trails where possible. Where slash occurs within the 300' immediate foreground of Concern Level 1 roads and trails, treat slash as soon as possible, within one year, to bring the scenery back to prescribed levels after project implementation.
- Generally restore control lines to a near undisturbed condition in the foregrounds (within 300 feet) of sensitive roads, trails, and developed recreation sites.
- To hasten recovery and help eliminate unauthorized motorized and non-motorized use of control lines in these areas, use measures such as recontouring, pulling slash and rocks across the line, and disguising entrances.
- Where trails are used, rehabilitate trails to original width, condition, and designated class level.
- If spring restoration or aspen fencing is visible from any Concern Level 1 roads, developed recreation sites and trails, work with Landscape Architect during project implementation to determine fencing materials to mitigate potential impacts to scenery and minimize visual impacts. Work with Landscape Architect during project implementation to ensure stability of scenic quality.

Trail Mitigations (within the McGaffey CE Decision) rolled into the Puerco Project

The following mitigation measure have been identified to be applied during treatment implementation. Priority for mitigation is within the 300 foot immediate foreground on either side of the identified trails and roads within the project area.

- Cattle guards should be removed, store in a secure location, and reinstalled to motorized trail standards upon completion of the project.
- The motorized ATV/UTV trail should be reconstructed to motorized trail standards upon completion of the project.

- Project activities should avoid even spacing of retained trees, and instead leave a diversity of tree species, sizes, and ages, avoid damage to vegetation that will remain, and naturalize disturbed areas.
- **Per Cibola National Forest Land and Resource Management Plan direction:** For areas with VQO of Retention, dispose of all activity slash within seen area or up to approximately 200 feet on either side of roads and trails.
- **Per Cibola National Forest Land and Resource Management Plan direction:** For areas with VQO of Partial Retention, dispose of all activity slash occurring within 200 feet of recreation sites, forest trails, forest roads, and paved or all-weather roads. Slash will be disposed of within 1 growing season after completion of the project which generates the slash.
- Do not locate slash in meadow areas but instead in areas with vegetation cover, outside of the 300 ft viewshed on either side of the roads and trails.
- Do not masticate removed material along the road or trail, but instead outside of the 300 foot immediate foreground.
- Mark trees that are to be removed on the backs of trunks, away from the primary viewing point (i.e. away from viewing location of trail).
- Within the 300 ft immediate foreground along trails and roads, stumps should be treated to reduce their visibility by methods such as cutting as low as possible (no more than 6 inches above ground on uphill and downhill side) and angling large stump faces away from viewing locations unless doing so would pose a safety hazard.
- Effects from prescribed fire should be considered during project planning and implementation. For example: (1) blackened and scorched vegetation may be visible in project areas in the short term following treatments, but desired conditions for scenery and visual resources should be met in the long term, and (2) efforts should be made to minimize high-intensity fire in riparian areas along system trails and scenic vistas.
- Log decks should be removed and rehabilitated, and skid trails should be naturalized.
- Avoid using trails as treatment unit boundaries especially for mechanical treatments.
- Provide public notice and information about treatment locations, timing and the type of treatment occurring prior to and during vegetation and fire treatments.
- Treatments extend up to the edges of the trails, and do not leave a screen of trees. Groups of trees complying with the prescribed treatment are left that visually connect with the treatment unit's edge, to avoid an abrupt and noticeable change.
- Where meadows are not being restored, "feather" treatment edges along the trail from more to fewer trees as treatments move away from the trail. Edges of treatment units will be shaped as described below to avoid abrupt changes between treated and untreated areas. Edges will be natural-appearing, feathered, and will blend with general surroundings. Feathering refers to softening treatment edges by thinning in the following manner:
 - Where the treatment unit is adjacent to denser forest (treated or untreated), the percent of thinning within the transition zone is progressively reduced toward the denser edges of the unit. Similarly, where the treatment unit interfaces with an opening (including savannah and grassland treatments, and natural openings) the transition zone is progressively increased toward the open edges of the unit.

- Treatment extends up to the edges and does not leave a screen of trees. Groups of trees complying with the prescribed treatment are left that visually connect with the unit's edge, to avoid an abrupt and noticeable change.
- Healthy large trees should comprise the majority of the immediate foreground along trails unless doing so would not achieve project goals; some younger and mid-aged trees are retained to serve as replacement trees and as additional screening.
- Depth of masticated material not to exceed 4" along trails
- Landings shall not be located within 300-foot-wide foreground on either side of trail
- Cull logs will not be abandoned on landings.
 - Use cull logs for closing temporary roads and decommissioning roads.
 - Cull logs may also be suitable to use as down woody material, but must be scattered away from the landings.

Road, Skid Trail and Landing Construction

- Minimize and avoid the placement of log decks, temporary roads, and skid trails within and adjacent to sensitive viewsheds, and along the trails
- Reseed and mulch decks as soon as possible to speed recovery, with high priority along the trails.
- Avoid using FS designated trails as skid trails or for temporary roads.
 - Temporary road construction and skid trail crossings may cross designated trails, but will be kept to a minimum. Any crossings will be perpendicular to the designated system trail.
 - If trails are used as skid trails/temporary roads, trail clean up and rehabilitation will be included in the contract. This should include restoring the trail to the designated trail width and standards.
 - Changes to trail alignment and surfacing will be minimized; the trail will not be straightened nor its surfacing changed with an alternate material unless such actions are approved by the District Recreation Staff and are needed to enhance the trail and protect resources.

Fire Control Lines

- Generally restore control lines to a near undisturbed condition in the foregrounds (within 300 feet) of sensitive roads, trails, and developed recreation sites.
 - To hasten recovery and help eliminate unauthorized motorized and non-motorized use of control lines in these areas, use measures such as recontouring, pulling slash and rocks across the line, and disguising entrances.

Watershed Resources

- Soil disturbance would be reduced or prevented in some areas through design features and best management practices (BMPs) as described in Appendix D of this document.
- Water resource features including riparian areas will have a designated management zone with widths that vary according to the type of water resource features. For riparian areas and

perennial streams, this buffer is 300 foot. Within this zone, mechanized and motorized activities would not be allowed, but chainsaws may be used.

Heritage and Cultural Resources

All eligible and unevaluated sites should be flagged for avoidance prior to the implementation of mechanical treatments. Mechanical treatments will not be allowed within eligible and unevaluated site boundaries. Mechanical equipment may pull material off the site (not drag) but may not cross the site unless crossings have been previously established and flagged by a qualified cultural resources specialist. Any mechanical treatment activities within site boundaries should be monitored by a qualified cultural resources specialist.

Hand-Thinning Units Treatment Mitigation

Treatments can be allowed within site boundaries provided:

- Cutting is accomplished using hand tools only
- Large diameter trees are felled away from all features
- Materials removed from the site are removed by hand
- No dragging of logs, trees, or thinned material across or within site boundaries.
- No use of vehicles or other mechanized equipment within site boundaries.
- No staging of equipment within site boundaries.
- No slash piles within site boundaries.

Fuelwood Collection Mitigation

If areas that have been thinned are going to be opened up to fuelwood collection, sites must be flagged prior to allowing collection in the area. Material thinned from the sites must be removed by hand from site boundaries prior to fuelwood collection. Logs, trees or thinned material should not be dragged across or within site boundaries. Vehicles or other mechanized equipment are not allowed within site boundaries during either hand thinning or fuelwood collection.

Protection of Fire-Sensitive Sites during Prescribed Burn Treatments

To ensure the protection of fire sensitive sites, various combinations of the following protection measures may be approved by the Forest or District Archaeologist to protect sites for projects listed in Section III of Appendix J of the First Amended Region 3 Programmatic Agreement. The protection measures do not require additional consultation with NMSHPO.

Protect fire-sensitive sites:

- Exclude from project area
- Hand line
- Black line
- Wet line
- Foam retardant

Road Maintenance and Decommissioning

Sites that lie adjacent proposed roadways will be flagged for avoidance prior to project implementation. Standard protection measures have been developed to protect sites for projects listed in Section III.1 Appendix E of the First Amended Region 3 Programmatic Agreement. The protection measures do not require additional consultation with NMSHPO.

- No earth-disturbing decommissioning and closure activities within the boundaries of eligible or unevaluated sites
- No use or staging of heavy mechanized equipment within site boundaries
- Allow road decommissioning activities within the boundaries of eligible or unevaluated sites if the Forest and the SHPO agree that the activities will have no effect or no adverse effect on the identified historic properties.

Fire/Fuels

- Best Management Practices (BMPs) for smoke management and compliance with The New Mexico smoke Management Program would be followed along with the Clean Air Act requirements that would be state regulated.
- Local area fire weather forecasts will be monitored daily before and during the implementation of any prescribed burn. Spot weather forecasts will be obtained daily for the operational periods of the burn. On-site weather readings will be monitored during operational periods as directed by the burn boss using a belt weather kit. The weather data that is recorded from the belt weather kit will be the primary weather readings that will be the determination factor for the go-no-go and for the prescription parameters.
- The Burn Boss will ensure that the project complies with all local, county, state, and federal air quality regulations. The project will be registered with the New Mexico Smoke Management program at least 2 weeks prior to implementation. Notification will be given 24 - 48 hours prior to ignition and a copy of the spot weather forecast will be faxed to the Mt Taylor Ranger District. A copy of our smoke monitoring report will also be faxed. Coordination between the Albuquerque zone dispatch center and neighboring agencies will be established. Burn will be terminated if the National Weather Service issues an air stagnation alert.
- Smoke conditions must be monitored carefully to assess potential impacts to highway traffic and populated areas. Monitoring should be visual and also may include instrument monitoring. Adequate ventilation or winds that carry smoke away from traffic or populated areas may be required to minimize impacts. The Burn Boss will determine if conditions are favorable at time of ignition.

Wildlife

- The implementation of any of the proposed thinning activities within Mexican spotted owl Protected activity centers (PAC) would occur from September 1st - February 28th.
- This project would be implemented in phases for the treatments types mentioned in Chapter 1 Proposed Action, so that fuel reduction activities and wood product removal would occur while providing mitigation for unintentional disturbance to migratory birds. The recommended Migratory Bird timing restriction for no management activity is from April 1st-July 31st. This timing restriction does not apply to vegetation treatments under the Migratory Bird Treaty Act.
- The implementation of any of the proposed thinning activities within northern goshawk PFA's and Nest Areas would occur from October 1st - February 28th.

- A dispersal PFA will be designated based on Forest Plan direction (pg. 71-7). No timing restrictions would apply in this area; however, the desired condition for PFAs would be created within the dispersal area.
- High intensity crown fires are not acceptable in the post-fledging family area or nest areas. Low intensity ground fires are allowed at any time in all forested cover types. Avoid burning the entire home range of a goshawk pair in a single year. For fires planned in the occupied nest area, a fire management plan should be prepared. The fire management plan should minimize the risk of goshawk abandonment while low intensity ground fire burns in the nesting area. Prescribed fire within nesting areas should be planned to move with prevailing winds away from the nest tree to minimize smoke and risk of crown fire developing and driving the adults off or consuming the nest tree.
- Prior to implementation, known populations of Zuni fleabane will be designated on the ground and avoided during restoration activities.
- If a Mexican gray wolf or denning site are discovered during project layout or implementation, activities in the immediate area would be temporarily halted and the district wildlife biologist and USFWS would be contacted to determine appropriate protection measures.
- In forested habitats, retain at least 2 snags per acre greater than 18 inches DBH and 30 feet tall, 3 downed logs per acre that are over 12 inches in diameter and 8 feet long, and 5-7 tons of woody debris per acre 3 inches or larger, except within fuel breaks and adjacent to control lines where retention would compromise fire fighter safety. Snags and logs that do not compromise fire fighter safety are to be left. Lighting techniques that allow for the retention of large logs and snags should be used.
- Large, downed woody materials (12-inch diameter midpoint and greater) and snags would be retained within riparian areas.
- Skid trails, landings and other intensely disturbed areas would be seeded with an approved native grass/forb/shrub seed mix.

Range Management

- Reconstruct burned fences.
- Treatment of invasive species should be designed to effectively control or eliminate them; multiple treatments may be needed.
- New livestock watering facilities shall be designed to allow wildlife access and escape.

Transportation

- Applicable soils and watershed best management practices (BMPs) will be used in the course of any project-related road work.
- All project-related traffic control (for example, signs warning road users of commercial vehicle traffic) will be conducted in accordance with the current versions of Manual on Uniform Traffic Control Devices (MUTCD) and Forest Service Engineering Manual 7100-15 (EM 7100-15): Sign and Poster Guidelines for the Forest Service.

- When road surface is wet, cease commercial activities that would cause excessive damage to the road surface.

Monitoring

1. Monitor potential sources of introduction of invasive species into the project area; included are rehabilitation of trails, roads, etc. through grass establishment or other means.
2. Smoke conditions must be monitored carefully to assess potential impacts to highway traffic and populated areas. Monitoring should be visual and also may include instrument monitoring. Adequate ventilation or winds that carry smoke away from traffic or populated areas may be required to minimize impacts. The Burn Boss will determine if conditions are favorable at time of ignition.
3. Precautions should be taken to ensure that the archaeological sites which may be fire sensitive are monitored before the onset of the proposed prescribe burns. Several of the possibly fire sensitive sites are located in areas with high fuel loads. In order to ensure that these sites are not subjected to damage from higher temperatures and prolonged exposure to heat, it is recommended that all possibly fire sensitive sites are monitored by a professional archaeologist prior to fire treatment plans. Depending upon the estimated fuel load and previous fire exposure, fuel loads and types that would adversely impact cultural material should be removed from sites prior to prescribed burns. It is essential that this effort is coordinated with the district or forest archaeologist. An archaeological monitor may be necessary to ensure that removal of fuels does not result in damage to sites.
4. Monitoring areas are reflective of the areas important to the livestock operation and reflective of the livestock management effects in pastures and, therefore, are important to assess when determining the return of livestock. Forage availability assessment on a pasture-by-pasture basis can provide reliable and valuable data. Important indicators to address when assessing forage availability include ground cover, species composition and forage production (R-3 Supplement, Consideration for Re-stocking and Management of Grazing Allotments Post Wildfire and Other Disturbances, 2015).
5. For a quick assessment of an allotment/pasture for grazing after prescribe burn or disturbance includes but not limited to: 1) seed heads or flowers present, 2) multiple leaves or branches present, and/or a root system that does not allow plants to easily pulled from ground (R-3 Supplement, Consideration for Re-stocking and Management of Grazing Allotments Post Wildfire and Other Disturbances, 2015).

Units of Measure/Indicators of Effects

- ♦ Percent ground cover – Percentage of ground surface covered by vegetation
- ♦ Lbs. of forage per acres – The amount of forage currently produced.

2.4 *New Mexico Forest Restoration Principles*

This project has considered all of the guidelines associated with the New Mexico Forest Restoration Principles.

1. **Collaborate.** Landscape scale assessment, and project design, analysis, implementation and monitoring should be carried out collaboratively by actively engaging a balanced and diverse group of stakeholders. *Collaboration has occurred during all phases of the analysis and continues with a varied group of stakeholders, including known interested individuals and organizations, environmental and tribal groups, and governmental agencies at local, state and federal levels (EA, Chapter 1 Public Involvement Section, Chapter 4, and Project Record).*
2. **Reduce the threat of unnatural crown fire.** A key restoration priority must be moving stands toward a more natural restored condition and the reduction of the risk of unnatural crown fires both within stands and across landscapes. Specific restoration strategies should vary based on forest vegetation type, fire regime, local conditions, and local management objectives. Forests and woodlands characterized by infrequent and mixed-severity fire should be managed toward a stand structure consistent with their historical ranges of variation—including, in some cases, high-density, continuous stands. Discontinuous stand structure may be appropriate to meet community protection objectives in areas such as the wildland urban interface for these forest and woodland types. *Reducing the threat of uncharacteristic wildfire is part of the purpose and need of this analysis (EA, Chapters 1 and 3, Fire/Fuels Specialists Report).*
3. **Prioritize and strategically target treatment areas.** Key considerations for prioritizing restoration treatment areas are: degree of unnatural crown fire risk, proximity to human developments and important watersheds, protection of old growth forests and habitats of federally threatened, endangered, or listed sensitive species, and strategic positioning to break up landscape-scale continuity of hazardous fuels. Treatments should be done at a landscape scale to decrease forest vulnerability to unnatural stand-replacing fire. This priority setting should take place during fire management planning, land management planning, and community wildfire protection planning. *See discussion in Background and Purpose and Need sections, Proposed Action, Treatment Types, CWPP, allocated old growth for Ponderosa Pine and woodland veg types (EA, Chapter 1, Vegetation and Fire/Fuels Specialists Reports).*
4. **Develop site-specific reference conditions.** Site-specific historical ecological data can provide information on the natural range of variability for key forest attributes, such as tree age structure and fire regimes that furnish local “reference conditions” for restoration design. A variety of constraints, however, prevent the development of historical information on every hectare of land needing restoration. General goals should be to restore ecological integrity and function. *The varied specialist reports and analyses are based on site-specific inventory information and were used as a basis to restore ecological integrity and function such as soil conditions, potential natural vegetation (PNV) and fire regime for Ponderosa Pine, woodland, and grassland/shrubland vegetation types (EA, Chapter 3).*
5. **Use low-impact techniques.** Restoration treatments should strive to use the least disruptive techniques, and balance intensity and extensiveness of treatments. In many areas, conservative initial treatments would be the minimum necessary to adequately reduce the threat of unnatural crown fire. Wildland fire use or management-ignited fires may be sufficient to re-establish natural conditions in many locations. In the extensive areas where fire alone cannot safely reduce tree densities and hazardous ladder fuels, mechanical thinning of trees may be needed before the introduction of prescribed fire. Patient, effective

treatments would provide more options for the future than aggressive attempts to restore 120 years of change at once. In certain areas, however, such as some wildland urban interfaces (WUIs), trade-offs with imminent crown fire risks require considerations of rapid, heavy thinning of mostly small diameter trees. *A variety of tools, ranging from hand thinning to mechanical harvesting to prescribed fire, and mitigations would be used to meet treatment objectives. Mechanical treatments are strategically placed so prescribed fire can be used at a landscape scale as the primary restoration tool. (EA, Chapter 2).*

6. **Utilize existing forest structure.** Restoration efforts should incorporate and build upon valuable existing forest structures, such as large trees, and groups of trees of any size with interlocking crowns, excluding aspen (*Populus* sp.). These features are important for some wildlife species, such as Abert's squirrel and northern goshawk, and should not be removed completely just to recreate specific historical tree locations. Since evidence of long-term stability of precise tree locations is lacking, especially for piñon and juniper, the selection of "leave" trees and tree clusters in restoration treatments can be based on the contemporary spatial distribution of trees, rather than pre-1900 tree positions. Maximizing use of existing forest structure can restore historical forest structure conditions more quickly. Leaving some relatively dense within-stand patches of trees need not compromise efforts to reduce landscape-scale crown fire risk. The underlying successional processes of natural tree regeneration and mortality should be incorporated into restoration design. Southwestern conifer regeneration occurs in episodic, often region-wide pulses, linked to wet-warm climate conditions and reduced fire occurrence. Periods with major regeneration pulses in the Southwest occurred in the 1910s–1920 and 1978–1998. Some of this regeneration would have survived under natural conditions. Restoration efforts should retain a proportion of these cohorts. *Working with and retaining, to the extent possible commensurate with project objectives, existing forest structure (including large trees and retention of groups of trees) is an integral part of the design of this project (EA, Proposed Action and Desired Condition, Chapter 1 and 2).*
7. **Restore ecosystem composition.** Missing or diminished compositional elements, such as herbaceous understories, or extirpated species also require restoration attention. The forest understory, including shrubs, grasses, forbs, snags, and downed logs, is an important ecosystem component that directly affects tree regeneration patterns, fire behavior, watershed functioning, wildlife habitat, and overall patterns of biodiversity. Similarly, soil organisms, such as mycorrhizal fungi, are vital elements that can influence community composition and dynamics. A robust understory provides a restraint on tree regeneration and is essential for carrying surface fires. The establishment and maintenance of more natural patterns of understory vegetation diversity and abundance are integral to ecological restoration. Restoration planning should include the conservation of habitats for diminished or extirpated wildlife species. Comprehensive forest ecosystem restoration requires balancing fire risk reduction with retention of forest structures necessary for canopy-dependent species. Recovery plans and conservation plans for threatened, endangered, and sensitive species should be incorporated to the fullest extent possible in planning for comprehensive forest restoration (*EA, Chapters 2 and 3*).
8. **Protect and maintain watershed and soil integrity.** Low impact treatments would minimize sedimentation, disruption of surface runoff, and other detrimental ecosystem effects. Equipment and techniques should be managed according to soil and water

- conservation “best management practices” applicable to site-specific soil types, physiographic and hydrological functions.
9. Reconstruction, maintenance, or decommissioning of existing roads to correct for poor hydrologic alignment and drainage condition can greatly reduce soil loss and sedimentation rates. Projects should strive for no net increase in road density.
 10. Managing forest density and fuels to avoid uncharacteristically intense wildfire events would reduce the likelihood of uncharacteristic post-fire soil erosion and nutrient depletion from forested landscapes. Soil productivity should be protected and maintained by avoiding soil loss and compaction, and managing for on-site nutrient retention. Avoid repeated whole tree biomass removal from the forest to maximize nutrient retention. Whenever feasible, green foliage should be recycled by scattering on site followed by prescribed burning to release stored nutrients (*EA, Chapter 2 and 3 and Soil and Water Resources Specialist Report*).
 11. **Preserve old or large trees while maintaining structural diversity and resilience.** Large and old trees, especially those established before ecosystem disruption by Euro-American settlement, are important forest components and critical to functionality of ecosystem processes. Their size and structural complexity provide critical wildlife habitat by broadly contributing crown cover, influencing understory vegetation patterns, and providing future snags. Ecological restoration should manage to ensure the continuing presence of large and old trees, both at the stand and landscape levels. This includes preserving the largest and oldest trees from cutting and crown fires, focusing treatments on excess numbers of small young trees.
 12. Develop “desired” forest condition objectives that favor the presence of both abundant large-diameter trees and an appropriate distribution of age classes on the landscape, with a wide distribution of older trees. It is generally advisable to maintain ponderosa pines larger than 16 inches DBH and other trees with old growth morphology regardless of size (e.g., yellow-barked ponderosa pine or any species with large drooping limbs, twisted trunks, or flattened tops).
 13. Treatments should also focus on achievement of spatial forest diversity by managing for variable densities. Overall, forest densities should be managed to maintain tree vigor and stand resiliency to natural disturbances. Disease conditions are managed to retain some presence of native forest pathogens on the landscape, but constrained so that forest sustainability is not jeopardized. Guidelines must provide opportunities to apply differing site-specific management strategies to work towards attainment of these goals and recognize that achievement may sometimes require more than one entry.
 14. Stand level even-aged management may be appropriate for some objectives, including disease management, post-wildfire tree regeneration, accelerating development of old growth characteristics, or for forest types for which even-aged stands are characteristic, such as spruce (*Picea* sp.) or aspen. Treatments should be identified through collaboration with key stakeholders. Some ponderosa pine forests contain extremely old trees and dead wood remnants that may be small but are important because they contain unique and rare scientific information in their growth rings. Such trees have become increasingly rare in the late twentieth century, and the initial reintroduction of fire often consumes these tree-ring resources. Restoration programs should preserve them where possible. *The existing*

condition for both ponderosa pine and piñon-juniper woodland is deficient of trees greater than 18" DBH and 12" DRC. This project proposes to focus on retention of trees over these diameters to assist in moving the area to desired uneven-aged conditions (EA, Chapters 2 and 3).

15. **Manage to restore historic tree species composition.** Forest density levels and the presence of fire in the ecosystem are key regulators of tree species composition. Where fire suppression has allowed fire-sensitive trees like junipers or shade-tolerant white fir or spruce to become abundant in historical ponderosa pine forests, treatments should restore dominance of more fire-resistant ponderosa pines. However, fire intolerant species sometimes make up the only remaining large tree component in a stand. Retention of these large trees is important to canopy-dependent wildlife species. In mixed conifer forests, landscapes should be managed for composition and structure that approximates the natural range of variability (*EA, Chapters 2 and 3 and Vegetation Specialist report*).
16. **Integrate process and structure.** Ecological sustainability requires the restoration of process and structure. Natural disturbance processes, including fire, insect outbreaks, and droughts, are irreplaceable shapers of the forest. In particular, fire regimes and stand structures interact and must be restored in an integrated way; mechanical thinning alone would not re-establish necessary natural disturbance regimes. At the same time, fire alone may be too imprecise or unsafe in many settings, so a combination of treatments may often be the safest and most certain restoration approach.
17. The single best indicator of whether a proposed approach should be considered as “ecological restoration” is to evaluate if the treatment would help successfully restore the fire regime that is natural for that forest type. Approaches that do not restore natural fire regimes would not achieve full ecological restoration (*EA, Chapter 3, Vegetation and Fuels Specialist Reports*).
18. **Control and avoid using exotic species.** Seeding of exotic grasses and forbs should be prohibited as ecologically incompatible with good restoration. Once established, exotic species can be extremely difficult or impossible to remove. Seeding should be conducted with certified or weed free seeds to reduce the risk of contamination by invasive species or varieties. In general, it is ecologically desirable to allow native herbaceous vegetation to recover incrementally unless there is potential for serious soil erosion or the potential for establishment of invasive plants. If enhancement of herbaceous vegetation is needed, especially for road closures and recovery, using locally sourced native seeds or transplanting individuals from nearby areas into treatments is ecologically desirable. Restoration treatments should also routinely incorporate early actions to control the establishment and spread of aggressive exotics that can be expected from restoration-related site disturbance. *Best Management Practices would be adhered to, including washing of equipment prior to entering treatment areas. Only native seed would be used for rehabilitation activities. (Soil and Water Resources Specialist Report).*
19. **Foster regional heterogeneity.** Biological communities vary at local, landscape, and regional scales, and so should restoration efforts. Ecological restoration should also incorporate the natural variability of disturbance regimes across heterogeneous landscapes. Heterogeneity should be fostered in planning and implementing ecological restoration and all spatial scales, including within and between stands, and across landscape and regional

scales (*EA, Chapter 3, Vegetation and Wildlife Specialist reports—specifically the analysis at the Ecosystem Management Area scale and associated Cibola National Forest and National Grasslands Land Management Plan direction*).

20. **Protect sensitive communities.** Certain ecological communities embedded within ponderosa pine or other types of forests and some riparian areas, could be adversely affected by on-site prescribed burning or mechanical thinning. Restoration efforts should protect these and other rare or sensitive habitats, which are often hotspots of biological diversity, particularly those that are declining in abundance and quality in the region (*EA, Chapter 3 Wildlife Specialists report*).
21. **Plan for restoration using a landscape perspective that recognizes cumulative effects.** Forest restoration projects should be linked to landscape assessments that identify historical range of variation (reference condition), current condition, restoration targets, and cumulative effects of management. Ecosystems are hierarchical; changing conditions at one level arise from processes occurring at lower levels and are constrained, in turn, by higher levels. The landscape perspective captures these complex relationships by linking resources and processes to the larger forest ecosystem. Forest restoration projects should incorporate plans for long-term maintenance of ecological processes (*EA, Chapter 2 and 3, specifically the Purpose and Need and Proposed Action which includes maintenance as monitoring data show that desired conditions are surpassing thresholds*).
22. **Manage grazing.** Grass, forbs, and shrub understories are essential to plant and animal diversity and soil stability. Robust understories are also necessary to restore natural fire regimes and to limit excessive tree seedling establishment. Where possible, livestock grazing after treatment should be deferred until the herbaceous layer has established its current potential structure, composition, and function. (*Range Management Specialist Report*)
23. **Establish monitoring and research programs and implement adaptive management.** Well-designed monitoring, research, and documentation are essential to evaluate and adapt ongoing restoration efforts. Monitoring programs must be in place prior to treatment and must evaluate responses of key ecosystem components and processes at multiple scales. Use research and monitoring results from a variety of sources to adjust and develop future restoration treatments. When possible, restoration projects should be set up as experiments with replicates and controls to test alternative hypotheses. The locations and prescriptions for all restoration treatments should be archived in a geographic information system (GIS), so that land managers and researchers have access to site-specific records of restoration treatments. *Monitoring would occur during all phases of project implementation. In addition the Cibola NF&NG will actively seek out partners with an interest in restoration to assist with monitoring. The Zuni Mountain CFLRP has built in monitoring requirements, and the Forest has an agreement with the Forest stewards Guild to perform post treatment monitoring.*
24. Exercise caution and use site-specific knowledge in restoring or managing piñon-juniper ecosystems and other woodlands and savannas. These systems are diverse and complex. Knowledge of local reference structure, composition, processes, and disturbance regimes is lacking or uncertain for many piñon-juniper ecosystem types. Given the diversity, variability, and complexity of piñon-juniper systems, identification of local reference

conditions is critical to the development of restoration objectives. Exercise caution and use best available science and site-specific knowledge in planning and implementing ecological restoration projects. Active management may be appropriate to mitigate soil erosion, community wildland fire hazard, or degraded hydrologic function in cases where historical ecological dynamics are insufficiently understood to justify ecological restoration. Piñon-juniper sites may be particularly susceptible to ecological damage from treatments; for example, soil erosion and invasion by invasive plants. *The varied specialist reports and analyses are based on site specific inventory information and were used as a basis to restore ecological integrity and function. Desired conditions for are aligned with TEUI interpretations (EA, Desired Condition, Proposed Action, Chapter 3).*

2.5 Comparison of Alternatives

Table 2.5.1 summarizes the differences among the alternatives and compares each of the alternatives against resource indicators that meet the project’s purpose and need, and would move the project toward desired conditions.

Table 2.5.1. Comparison of Alternatives

Resource Indicator	Alternative A No Action	Alternative B Proposed Action
Commercial Thinning with Prescribed Burning	0	31,442 acres
Low Thinning and No Prescribed Burning	0	23,328 acres
Low Thinning with Prescribed Burning	0	3,034 acres
Mechanical thinning, Mastication with Prescribed Burning	0	14,894 acres
Grassland/Shrubland Restoration	0	8,237 acres
Dwarf Mistletoe Focus (included in acres above)	0	5,900 acres
Prescribe Burning Only	0	8,280 acres
Riparian area improvement	0	250 acres
Spring, Aspen and Willow Protection	0	300 acres
Mexican Spotted Owl Habitat Treatments	0	3,700 acres
Northern Goshawk Habitat Treatments	0	4,210 acres
Unauthorized Road Closure/Rehabilitation	0	≈ 200 miles

3 Environmental Consequences

This section summarizes the physical, biological, and social environments of the affected project area and the potential changes to those environments due to implementation of the alternatives. Complete specialist reports are in the project record.

3.1 Vegetation

Affected Environment

Forest vegetation in the Puerco project area is highly departed from desired conditions, lacking multi-storied structure and age classes, spatial arrangement, and are very dense as measured by basal area, trees per acre and percent canopy cover (Table 3.1.1). Because of the existing conditions most forest and woodlands in the project area are prone to uncharacteristic disturbances such as active crown fire behavior, insects and disease, and climate change.

Table 3.1.1. Average Existing Forest Conditions

Existing Vegetation Cover Type	Basal Area/Acre (ft ²)	Trees per Acre	Trees per Acre (5"+)	Trees per Acre (18"+)	Average Diameter (QMD 5"+) ¹³	Canopy Cover (%)	Crowning Index (MPH) ¹⁴
Mixed Conifer	138	2,900	227	7	9.6	59	26
Ponderosa Pine	119	1,503	167	9	11.4	44	36
Ponderosa Pine-Gambel oak	127	1,513	167	10	10.7	45	38
Pinyon-juniper	116	1,103	152	10	11.2	41	27
Rocky Mtn. Juniper	127	1,932	171	9	11.0	45	51
Deciduous Oak	121	2,428	162	6	10.0	47	59

Forest structure is predominantly even-aged, with only 1-2 distinct canopy layers (age classes) consisting of young and mid-age trees (5-18" diameter). Seedlings/saplings and mature/old trees are deficient across the landscape. Historically occurring openings and canopy gaps have filled in with trees that make crown fires more likely.

Dwarf mistletoe occurs at levels that exceed 20% or more of the host trees infected on approximately 5,900 acres of ponderosa pine and mixed conifer forests. These acres may be suitable for more intensive even-aged management treatments designed to improve forest health and resiliency.

¹³ Quadratic Mean Diameter (QMD) is the diameter of the tree of average per tree basal area, which is considered more appropriate than arithmetic mean for characterizing a group of measured trees.

¹⁴ Crowning Index is the open wind speed at which fully active crown fire is possible.

Several different fire regimes are represented across the project area, ranging from frequent low-intensity fires that historically occurred in ponderosa pine and dry mixed conifer (Fire Regime I: 0-35 year frequency) to mixed severity and stand replacing fires that occurred in pinyon-juniper woodlands (Fire Regime III-V: 35-100+ year frequency). Currently, across much of the project area, fuel loading and tree densities are such that mortality would be high in the event of a wildfire burning under undesirable conditions. The average crowning index across the project area is 35 miles per hour, which is fairly typical on spring day in the Zuni Mountains. In the grass and shrublands of the Puerco project, fire has been excluded and conifers have encroached into these naturally open areas, decreasing their size and function.

Quaking aspen in the Puerco project area does not occur in large pure stands, and is dying or rapidly declining due to the combined effects of conifer encroachment, browsing, insects, disease, and lack of fire disturbance. Aspen and willows provide habitat for songbirds and small mammals, as well as soil and stream bank stability, and are also declining in health, vigor, and number in the project area.

Old Growth

Old growth resources were analyzed at multiple scales, the first being the midscale “Zuni Mountain Collaborative Forest Landscape Restoration Project (CFLRP)” Ecosystem Management Area (EMA) which includes a majority National Forest System (NFS) land in the Zuni Mountains (Figure 3.1.1); one scale above, which includes the Zuni Mountain CFLRP Ecosystem Management Area plus National Forest System lands west of the hogback and CFLRP footprint; and, at one scale below, at the Puerco Landscape Restoration Project level. Analysis maps are available in project record.

GIS analysis was used to incorporate a variety of resource information including common stand exam data, mid-scale vegetation data, local knowledge and a review of past disturbances relating to past vegetation management, insect/disease and fire activities. Existing old growth structural conditions, as defined on page 65-66 of the LRMP, are not well represented in any of the scales being analyzed, but those areas that most closely meet desired old growth attributes of tree size and density were identified to be managed as developing old growth.

Allocation of at least 20%, by forested ecosystem management area, of old growth has been completed (LRMP, page 65). Sites with the most potential to reach old growth status in the earliest timeframe have been allocated for each representative forest type in the project area, and will be developed to improve or maintain old growth characteristics such as age, size, and structural components.

EMA Scale - The Zuni Mountain CFLRP Ecosystem Management Area is characterized by a long history of anthropogenic disturbances, with the earliest evidence of general pre-contact activity in the Zuni Mountains dating to the Archaic Period (8000 BC – AD 400). The period the

steam railroad logging in the Zuni Mountains of western New Mexico was not much over thirty years (1890-1920). Once all the trees were gone, the lumbermen closed their mills, pulled up their railroad tracks, and moved on to greener forests (Kosik 2017). The result of past railroad logging is that most of the accessible large and old trees were harvested, leaving a current deficit in trees and stands of trees that qualify as old growth today. Other than the Sedgewick and most recent Diener Canyon and Bluewater Fires, prescribed and wildfire activity has been minimal across the Zuni Mountains.

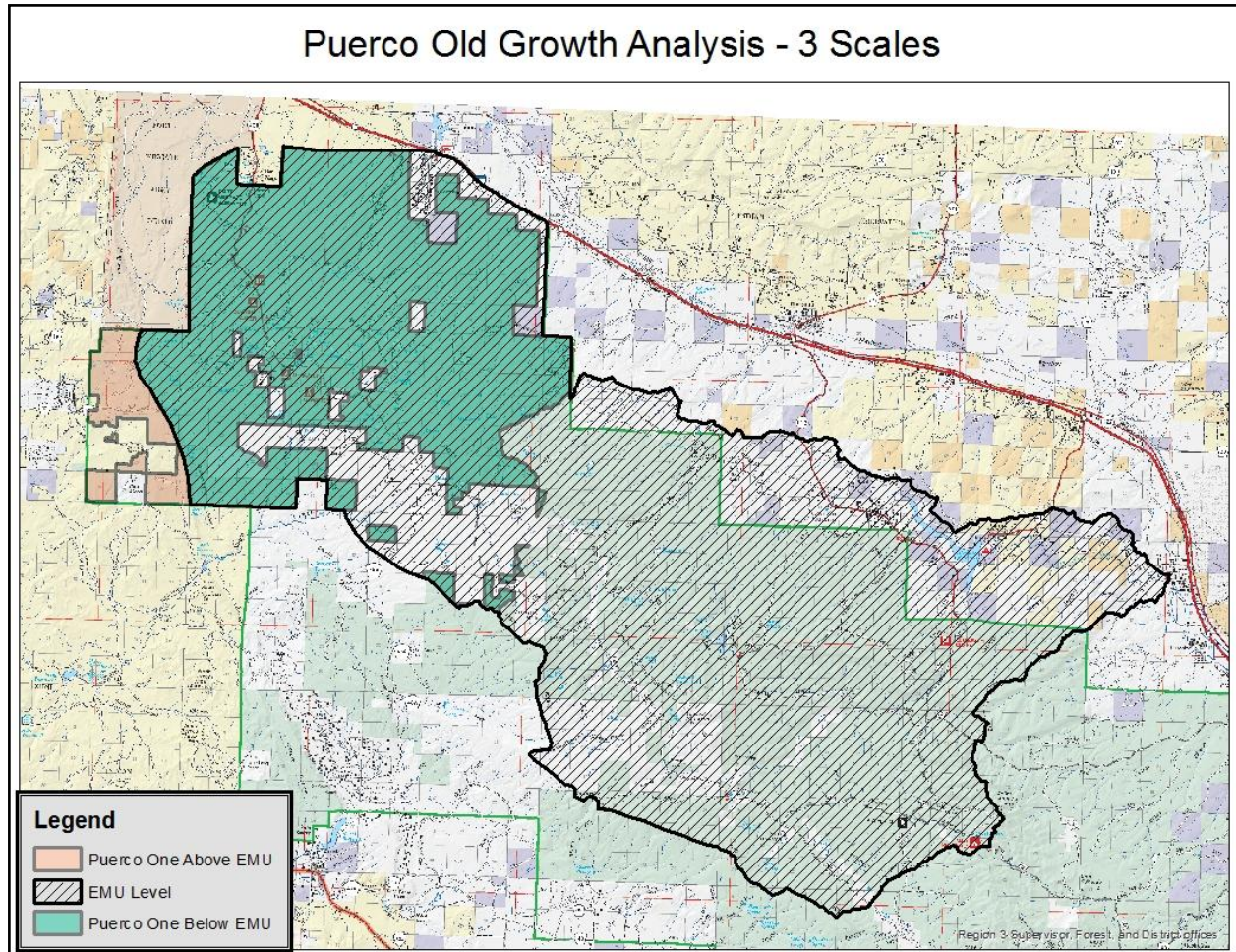


Figure 3.1.2. Vegetation Treatment Types and Implementation Phases

Tables 3.1.2 – 3.1.4 show the allocation of forest types included in this project to be managed for old growth characteristics within the Zuni Mountain CFLRP Ecosystem Management Area. Included are “de facto” old growth areas (LRMP, page 55) such as Mexican Spotted and goshawk nesting areas.

Puerco Collaborative Forest Landscape Restoration Project
3. Environmental Consequences

Table 3.1.2. Old Growth Allocation within the Zuni Mountain CFLRP EMA

Desired Vegetation	Total Acres	Target O.G.	Total O.G. Designated	% O.G. Designated
Mixed Conifer	6,439	1,288	2,581	40%
Pine-oak	15,033	3,007	3,437	23%
Ponderosa Pine	93,012	18,602	18,233	20%
Pinyon-juniper	21,595	4,319	5,074	23%
PIPO/P-J Mix	13,403	2,681	2,968	22%
	149,482	29,896	32,293	22%

One scale above - The Zuni Mountain CFLRP Ecosystem Management Area plus NFS lands west of the Hogback and CFLRP footprint to comprise a scale above that initial area. Historic disturbances within the area west of the Hogback are more limited than in the Zuni Mountain CFLRP ecosystem area due to lack of access and lack of historic fire activity.

Table 3.1.3 displays the combined old growth allocated acres by forest type for both the Zuni Mountain CFLRP Ecosystem Management Area plus NFS lands west of the Hogback and CFLRP footprint.

Table 3.1.3. Old Growth Allocation within the Zuni Mountain CFLRP Ecosystem Management Area plus National Forest System lands west of the hogback and CFLRP footprint

Desired Vegetation	Total Acres	Target O.G.	Total O.G. Designated	% O.G. Designated
Mixed Conifer	6,439	1,288	2,581	40%
Pine-oak	15,359	3,072	3,495	23%
Ponderosa Pine	93,022	18,604	18,235	20%
Pinyon-juniper	22,750	4,550	5,380	24%
PIPO/P-J Mix	16,373	3,275	3,329	20%
	153,943	30,789	33,020	21%

One scale below - The Puerco Project area comprises the scale below the initially described Zuni Mountain CFLRP Ecosystem Management Area. This project area represents the western portion of the Zuni Mountain CFLRP Ecosystem Management Area that would be the continuation of forest restoration efforts initiated by the Bluewater Ecosystem Restoration Project. Table 3.1.4 shows those areas selected for allocation towards old growth by forest type within the Puerco CFLRP.

Table 3.1.4. Old Growth Allocation within the Puerco Collaborative Landscape Restoration Project

Desired Vegetation	Total Acres	Target O.G.	Total O.G. Designated	% O.G. Designated
Mixed Conifer	776	155	231	30%
Pine-oak	15,033	3,007	3,437	23%
Ponderosa Pine	24,969	4,994	5,590	22%

Puerco Collaborative Forest Landscape Restoration Project
3. Environmental Consequences

Pinyon-juniper	18,544	3,709	4,750	26%
PIPO/P-J Mix	13,403	2,681	2,968	22%
	72,725	14,545	16,976	23%

Northern Goshawk Habitat

Distribution of habitat structures (LRMP, page 71-7) for the Northern Goshawk are analyzed at the Zuni Mountain CFLRP Ecosystem Management Area scale, the Puerco Landscape Restoration Project scale and site (stand) scale.

The majority of the Puerco Collaborative Landscape Restoration Project area is classified as ponderosa pine and pinyon-juniper forest types. Forest plan guidelines for the distribution of vegetation structural stages for ponderosa pine, mixed conifer and spruce-fir forests is 10 percent grass/forb/shrub (VSS1), 10 percent seedling-sapling (VSS2), 20 percent young forest (VSS3), 20 percent mid-aged forest (VSS4), 20 percent mature forest (VSS5), 20 percent old forest (VSS6). NOTE: The specified percentages are a guide and actual percentages are expected to vary + or - up to three percent.

The distribution of VSS, tree density, and tree age are a product of site quality in the ecosystem management area. Use site quality to guide in the distribution of VSS, tree density and tree ages.

Forest plan guidelines for the woodland forest type within landscapes outside goshawk post-fledgling family areas are; “Manage for uneven age conditions to sustain a mosaic of vegetation densities (overstory and understory), age classes, and species composition well distributed across the landscape. Provide for reserve trees, snags, and down woody debris.” Guidelines for woodland forest type within PFA and nesting areas are to “maintain existing canopy cover levels. (LRMP, page 71-8).”

There are no Vegetation Structural Stage (VSS) distribution guidelines for the woodland stands like there are for ponderosa pine, mixed conifer and spruce-fir forest types. Therefore, no VSS analysis will be displayed for the woodland type. Data supporting this analysis is from stand examinations completed from 2013-2015, the Forest Vegetation Simulator, and Field Sampled Vegetation (FSVeg) Spatial Data Analyzer. Tables 3.1.5 –and 3.1.6 display the distribution of ponderosa pine forest type at each Vegetation Structural Stage (VSS) at three levels of analysis. Because of on-going restoration treatments in the Bluewater Project, it is assumed that trends shown from modeling the proposed action (one scale below) will progress along a similar trajectory at the EMA and one scale above levels.

Puerco Collaborative Forest Landscape Restoration Project
3. Environmental Consequences

Table 3.1.5. Vegetative Structural Stage Analysis – One Scale below EMA (Puerco Project Area)

Scale	VSS 1&2 (0-4.9 inch DBH)	VSS 3 (5-11.9 inch DBH)	VSS 4 (12-17.9 inch DBH)	VSS 5 (18-23.9 inch DBH)	VSS 6 (24 inch+ DBH)
Desired Distribution	20%	20%	20%	20%	20%
Existing Condition	3%	49%	31%	15%	2%
Post Treatment	2%	40%	41%	13%	4%
30 Years Post Treatment	4%	16%	45%	26%	9%

The existing condition in Puerco the Project represents a bell-shaped curve, with the majority of basal area currently in the mid-aged stages (5-18" DBH), overwhelming representative of even-aged conditions. Post treatment conditions reflect the focus on targeting mid-aged trees as the percentage of VSS3 is reduced. The amount of basal area represented by trees 12" DBH and greater increases from 47 to 58%. Thirty years after implementing the proposed action, the amount of basal area in trees 18"+ DBH has doubled, and trees that were previously VSS3 have grown into VSS4 due to reduced competition.

Table 3.1.6. Vegetative Structural Stage Analysis – EMA Scale & One Scale Above

Scale	VSS 1&2 (0-4.9" DBH)	VSS 3 (5-11.9" DBH)	VSS 4 (12-17.9" DBH)	VSS 5 (18-23.9" DBH)	VSS 6 (24"+ DBH)
Desired Distribution	20%	20%	20%	20%	20%
Existing Condition	3%	49%	31%	15%	2%
Post Treatment	static	decreasing	increasing	decreasing	increasing
30 Years Post Treatment	increasing	decreasing	increasing	increasing	increasing

Modeling shows little to no gain in trees less than 5" DBH (VSS1&2) because regeneration was not input into the model. Natural regeneration of ponderosa pine in the southwest is episodic, depending upon individual site conditions and a combination of good cone crops followed by a wet spring to encourage germination. Observations from the adjacent Bluewater Project show that natural regeneration of ponderosa pine is occurring in stands that have been harvested in the past 3-10 years using the same uneven-aged silvicultural system as proposed in the Puerco Project. It is expected that after 30 years there will have been several pulses of natural regeneration and seedlings will have established and grown into young trees, thus balancing out the VSS distribution.

Green House Gases (GHG) emissions and carbon sequestration are a consideration in any vegetation manipulation project. Forests play a major role in the carbon cycle. The carbon stored in live biomass, dead plant material, and soil represents the balance between carbon dioxide absorbed from the atmosphere and its release through respiration, decomposition, and burning.

Mexican Spotted Owl Habitat

Mexican spotted owl habitat in the Puerco project area is highly departed from desired conditions, lacking large trees, multi-storied structure, spatial arrangement, and density as measured by basal area, trees per acre and percent canopy cover. Because of past management, forest and woodlands in the project area are prone to uncharacteristic disturbances such as active crown fire behavior, insects and disease, and climate change.

Table 3.1.7. Average Existing Conditions in Mexican Spotted Owl Habitat

PAC Name	BA/ Acre	BA 5"+	BA 18"+	BAGO 5"+	TPA	TPA 5"+	TPA 18"+	QMD	% CC	SDI 12-18"	SDI 18-24"	SDI 24"+	Crown Index	Torch Index	Stand DMR
Smith Canyon	140	117	16	17	1,997	253	7	9.6	50	21%	9%	3%	35	31	0.17
Foster	128	112	23	22	1,993	196	9	10.8	45	29%	14%	4%	39	20	0.08
Milk Ranch	131	104	32	4	2,142	178	12	10.6	46	18%	14%	7%	29	6	0.18
Agua Remora	120	94	29	6	2,093	139	12	10.9	48	21%	14%	3%	34	19	0.01
Hogback	136	113	27	11	2,673	180	10	11.0	50	25%	11%	6%	34	28	0.05
Brennan Spring	124	111	29	13	789	170	11	11.0	42	27%	12%	8%	38	53	0.15
6-Mile	116	97	27	4	1,081	160	10	10.7	42	20%	13%	7%	33	15	0.19
Average:	128	107	26	11	1,816	182	10	10.7	46	23%	12%	5%	35	25	0.12

BA = Basal Area (ft²/acre), **BAGO** = Basal area of Gambel Oak, **TPA** = Trees per acre, **QMD** = Quadratic mean diameter (average diameter of 5"+ diameter trees), **SDI** = Stand Density Index, **Crown Index** = Wind speed needed to carry a crown fire (mph), **Torch Index** = Wind speed needed to torch individual trees (mph), **DMR** = Dwarf mistletoe rating (% of all trees infected in the stand – all species).

Stand examination data was collected for the Puerco project between 2012 and 2015 (Table 3.1.7). Very little data was gathered from PACs that were already established at the time of data collection, or from PACs that have since been delineated as a result of MSO surveys. As a result, the data shown in the table above was largely imputed using the “nearest neighbor” program, which populates

stands without data using information from stands with current data that are similar in elevation, aspect, and vegetation (density and composition). These areas have not been field checked to verify the accuracy of these imputations.

Modeling indicates that all of the Mexican spotted owl protected activity centers (PAC) in the Puerco project are densely stocked, averaging 128 ft² of basal area per acre and approximately 1,800 trees per acre. Ponderosa pine – Gambel oak dominates the existing habitat, with mixed conifer existing in mostly steep, north-facing slopes found in canyons. Seedlings and saplings less than 5” diameter account for 90% of the trees per acre. Larger trees greater than 18” diameter are scarce within the PACs, averaging 10 trees per acre. This is also reflected in the average tree diameter and stand density indices, which are indicative of a forest that is growing under intense competition that hampers individual tree (i.e. - diameter) growth. Dwarf mistletoe ratings are generally low, but dense stand conditions are conducive to increased spread, reduced tree vigor and elevated mortality. Stand-replacing fire danger is high. Individual trees may torch under winds of 25 miles per hour (mph), and a crown fire may be initiated under wind speeds of 35 mph, both of which are common during the spring and monsoonal events.

Proposed restoration treatments that target removal of the smallest diameter trees, while featuring the largest, oldest trees (including Gambel oak), would reduce competition and increase overall vigor and resiliency making stands less susceptible to threats from fire, insects, disease and climate change. Distribution of large conifers and oak would be increased as smaller trees are cut to reduce ladder fuels and crown fire potential. Stands would be placed on a trajectory to more rapidly achieve desired habitat for the Mexican spotted owl while reducing the risk of disturbances that could lead to further reduction or complete loss.

Environmental Consequences

Alternative A – No Action

The No Action alternative would result in custodial management (no treatment) of existing forest vegetation conditions. The forest ecosystem would remain susceptible to the adverse effects of uncharacteristic wildfire and insect/disease outbreak with increasing risk of these disturbances over time as densities increase, tree growth and resiliency declines.

Fuel conditions (quantities and distribution) would remain relatively unchanged across the landscape over the short term. Competition induced mortality will slowly begin to increase leading to additional fuels accumulating on the forest floor. This, plus high tree densities, continuous canopy cover and ladder fuels would favor active crown fire and uncharacteristic fire events that would adversely affect forest vegetation and species composition (i.e. – conversion to shrub brush fields).

Stand structure (the horizontal and vertical distribution of forest components including the height, diameter, crown layers, and numbers of trees, shrubs, snags and down woody debris) would remain relatively unchanged in the short term. Vertical structure would remain predominantly even-aged (1-2 canopy layers) and horizontal structure would remain continuous with few openings to break up the otherwise continuous canopy. Ladder fuels would remain favoring movement of surface fires into tree canopies.

The current stand density index (SDI) for ponderosa pine is 287, which is 64% of maximum (SDIMax) indicating high competition among trees and density related mortality. After 30 years with no action, the SDI increases to 330, which is 73% of SDIMax. Forest vegetation would continue to grow but at reduced rates due to unnaturally high tree densities across the landscape, which is a result of overcrowding and competition for limited water, sunlight and soil nutrients. Trees, both on an individual and landscape basis, would continue to be stressed and more susceptible to drought or insect and disease attack due to the unnaturally high level of competition.

Table 3.1.8. Puerco Forest Conditions – No Action 30 Years Later

Forest Type	BA/Acre (Ft ²)	Canopy Cover (%)	Trees per Acre	Trees per Acre (5"+)	Trees per Acre (18"+)	Average Diameter (QMD 5"+)	DMR	Crowning Index (MPH)
Mixed Conifer	181	66	1,842	212	11	11	0.26	28
Ponderosa Pine	150	49	959	156	16	13	0.24	37

Puerco Collaborative Forest Landscape Restoration Project
3. Environmental Consequences

Ponderosa Pine - Oak	161	53	1,081	230	14	11	0.18	37
Rocky Mtn. Juniper	165	55	1,079	207	13	12	0.02	44
P-J Woodland	148	47	539	185	15	12	0.83	24
Deciduous Oak Woodland	164	59	1,471	297	9	9	0.06	51
Misc. Hardwoods	192	83	924	538	11	8	0.0002	38
	153	50	857	190	15	12.2	0.42	32

Under the No Action alternative, basal area and canopy cover increase by about 30% from 117 to 153 ft² per acre and 39% to 50% respectively over the Proposed Action. Dramatic increases in stand density and basal area over the past century represent an increased susceptibility for bark beetle epidemics and stand-replacing wildfire (Margaret M. Moore, et al. 2004), and conditions would continue on this unsustainable trajectory under No Action. Research indicates that risk of Mountain Pine beetle attack in Ponderosa pine increases from a level of low to moderate when residual basal areas exceed 100 ft²/ac (Munson and Anhold. 2000). The same concept would apply in the Pinyon-Juniper woodland in relation to the pinyon Ips beetle and density-related impacts.

The number of trees per acre greater than 5" diameter increases by 43% under No Action compared to the Proposed Action, but the number of trees greater than 18" only increase by 1 tree per acre. This further illustrates that under No Action, forests become increasing overcrowded, under greater competitive stress and more susceptible to disturbances such as insects, disease, and wildfire. Forests at this density level (153 ft² of basal area per acre and 857 trees per acre) would experience increased tree mortality and fuel loading.

Currently undesirable structural conditions within Northern Goshawk foraging, PFA and nesting habitats and MSO Restricted Habitats would remain essentially unchanged and would remain so for an indefinite period of time until disturbed by natural factors (wildfire or insect/disease outbreak). In the event of such disturbances, such key habitat would be at risk. The average dwarf mistletoe rating increases after 30 years under No Action, but decreases under the preferred alternative. The crowning index shows that with No Action it would only take 32 mph winds to carry a fire up into the canopy after 30 years of No Action, continuing the risk of an uncharacteristic crown fire that could devastate habitat.

Development of old growth conditions would continue at their current rate. In the absence of major stand disturbing events, tree densities and canopy cover would remain at uncharacteristically high levels, more prone to disturbance agents such as insects, disease, and wildfires. Tree diameters would continue to increase slightly, but remain largely stagnant due to extreme competition. Standing and down dead trees would likely increase as density related mortality becomes more evident.

Invasive plant species would continue to be identified and mapped through random surveys in the area. The increase in size and density of invasive plants would continue to crowd out native

plant communities. Areas along roadways, riparian areas and developed recreation sites and disturbed sites would be most vulnerable to invasive species colonization, and these areas would be impacted earliest and most seriously.

The grass/forb/shrub component would continue to lack in diversity, vigor and abundance.

Recruitment and enhancement of old growth at all scales would continue to occur, although at the current, slower pace; in addition, such areas would be susceptible to uncharacteristic wildfire and/or insect/disease outbreaks.

Green House Gases (GHG) emissions and carbon sequestration levels would continue at current levels.

Alternative B

The Proposed Action effectively provides for more sustainable and resilient forest conditions from the perspective of reducing the likelihood of both uncharacteristic wildfire and insect/disease outbreak. Reducing tree densities, ladder fuels, and fuel loading as well as improving both vertical and horizontal structural diversity will improve resiliency to disturbances and lessen the likelihood of stand replacing wildfire.

Table 3.1.8. Puerco Forest Conditions – Post Treatment

Forest Type	BA/Acre (Ft²)	Canopy Cover (%)	Trees per Acre	Trees per Acre (5"+)	Trees per Acre 18"+	Average Diameter (QMD 5"+)	DMR	Crowning Index (MPH)
Mixed Conifer	87	39	1,426	141	5	10.8	0.11	40
Ponderosa Pine	80	30	920	98	8	12.3	0.11	50
Ponderosa Pine - Oak	95	34	1,117	150	9	10.8	0.05	54
Rocky Mtn Juniper	92	32	1,244	123	8	11.4	0.02	62
P-J Woodland	87	30	492	106	9	12.2	0.10	41
Deciduous Oak Woodland	91	37	2,351	173	6	9.9	0.59	40
Misc. Hardwoods	69	44	1,183	71	4	11.8	0.00	134
	86	31	858	114	9	12	0.10	48

Post treatment modeling shows that across the project basal area per acre would be reduced by about 30% from pretreatment levels. These totals include an average treated and untreated stands. Canopy cover is reduced from 43 to 31%, reducing the risk of crown fire. This is further supported by the increase in the crowning index, which would jump from 35 to 46 miles per hour – the wind speed required to carry a fire through the forest canopy. The trees per acre 5" DBH and larger would be reduced from 166 to 144, while the number of 18"+ DBH trees per acre would remain the same. This demonstrates the objective of targeting overstocked mid-aged trees in the 5-18" diameter classes.

Puerco Collaborative Forest Landscape Restoration Project
3. Environmental Consequences

Under Alternative B, total trees per acre would be reduced from an average of 1,399 to 858, the majority of which are Gambel oak less than 5" diameter. The number of remaining conifers in the overstory would be approximately 100 trees per acre. Implementing follow up prescribed burning would reduce the amount oak stems per acre. The quadratic mean diameter across the project area would increase by about one inch, from 11.2 to 11.9". Dwarf mistletoe, while not eliminated, would be reduced by about 50% across the project area. Areas specifically targeted for more intensive sanitation treatments of mistletoe would only retain visible infection on trees 24" DBH and larger and those that have old growth characteristic.

Table 3.1.9. Puerco Forest Conditions – 30 Years Post Treatment

Forest Type	BA/Acre (Ft ²)	Canopy Cover (%)	Trees per Acre	Trees per Acre (5"+)	Trees per Acre (18"+)	Average Diameter (QMD 5"+)	DMR	Crowning Index (MPH)
Mixed Conifer	135	50	1,150	182	10	11.6	0.17	33
Ponderosa Pine	110	38	696	104	14	14.1	0.17	43
Ponderosa Pine - Oak	120	41	941	154	13	12.1	0.14	46
Rocky Mtn. Juniper	130	44	933	162	13	12.0	0.04	49
P-J Woodland	118	37	391	137	15	12.6	0.17	32
Deciduous Oak Woodland	142	53	1,565	238	10	9.9	0.04	66
Misc. Hardwoods	130	70	878	282	9	9.4	0.00	53
	117	39	671	133	14	12.9	0.15	40

Post treatment modeling indicates that after 30 years basal area and canopy cover return near pretreatment levels. Total trees per acre would remain at about one-half of the pretreatment level, and trees per acre less than 5" DBH would decrease from 166 to 133 trees per acre. The modeling did not simulate prescribed burning, nor did it simulate planting or natural regeneration, but it can be inferred that managed fire would further reduce overall trees per acre while preparing the seedbed for natural regeneration of desired conifers moving closer to desired uneven-aged conditions. Trees per acre greater than 18" and average diameter would also increase, improving habitat for the northern goshawks and Mexican spotted owl. The dwarf mistletoe rating and crowning index across the project area would remain at below pretreatment levels.

Key wildlife habitat objectives (enhancement and protection of Northern Goshawk foraging, PFA and nesting sites; MSO Restricted Habitat; as well as old growth) would be more readily met. Old growth recruitment/development at the project scale would be enhanced through reduction of small tree densities and resultant improvement in tree vigor, growth and multi-aged structure. Allocated old growth areas would be better protected from catastrophic wildfire and insect/disease outbreaks through reduction of stand densities to more historic levels and breaking up the continuous canopy that is prone to crown fires.

Management objectives, including the broader scale implementation of uneven-aged management, as provided in the LRMP are more closely achieved. Desired Vegetative Structural Stage (VSS) class distribution would be improved, and moved toward more desired balances, while creating opportunities for recruitment of VSS classes 1 and 2 (seedlings and saplings 0-5" diameter) over approximately 10-20% of each of the forest type. Increased development of the mature and old (18"+ diameter) forest classes through reduced competition and increased tree vigor would occur. These structural conditions would not be completely achieved in this initial entry but would be placed on a trajectory towards meeting desired uneven-aged conditions in the future and allow greater flexibility to maintain .

The percent of maximum Stand Density Index (SDI_{max}) level would initially be decreased by about 30% percent in the ponderosa pine forest type providing for more open forest conditions, encouragement of natural regeneration, increased tree growth/vigor and recruitment of understory grasses, forbs and shrubs. Subsequent levels would vary by forest type would generally provide for limited completion between trees and increased tree vigor and resiliency. Within the Mixed Conifer forest type, percent of maximum SDI levels would be higher but would still meet LRMP direction for MSO Restricted Habitat and provide for enhanced forest health conditions.

At the group level, canopy cover would meet the LRMP requirements within the VSS 4 through VSS 6 groups, in the ponderosa pine type and canopy cover will be maintained within PFA and nesting areas in the woodland type. Outside the Puerco Project area, canopy cover levels would remain at current levels and continue to increase over time.

The risk of pinyon Ips (Pinyon-Juniper woodland) and Mountain Pine Beetle (Ponderosa pine) attack would be minimized through lower tree densities and increased tree vigor, allowing for trees to more successfully fend off bark beetle attacks.

Reintroduction of fire either associated with mechanical treatment or not, is expected to decrease the current level of departure from the historic fire regime. Past and present research results suggest mechanical aerial fuel reduction (i.e., reduced canopy bulk density) followed by frequent prescribed fire is well suited as a management tool to restore and sustain entire watersheds and their ecological functions, particularly in pine-grassland forests (Cram et al. 2006). Additionally, they observed that mechanical treatment followed by prescribed fire (including pile burning) had the greatest influence toward mitigating fire severity. Specifically, as density and basal area decreased and mean tree diameter increased, fire severity decreased. A similar pattern was reported by McHugh and Kolb (2003) in terms of decreased tree mortality (three years following fire) as tree diameters increased from small to intermediate trees.

Mechanical thinning of overstocked trees prior to burning has been shown to improve understory response when compared to only burning. Reduced competition with remaining trees and increased light infiltration play an important role in promoting the understory (McGlone and

Egan 2009). Expected effects on some of the major plant species occurring in the project area are detailed in the following paragraphs.

Mountain muhly density generally decreases from pre-fire values during the first few years after fire, but it may increase over original values thereafter. Mountain muhly usually takes at least 3 years to fully recover from fire (Gaines et al. 1958). However, after prescribed fire in central Arizona, mountain muhly had recovered pre-fire biomass within 10 months. Mountain muhly may sprout after aerial portions are burned.

Arizona fescue survives most fires. In a review, researchers indicate that Arizona fescue recovery is typically quick with summer monsoon moisture that follows dry-season surface fires in ponderosa pine forests of Arizona and New Mexico. Arizona fescue production and abundance may even be greater on burned than unburned sites following surface or low-severity fires (Sackett et al. 1996). Severe fires, however, can reduce Arizona fescue abundance.

The Gambel oak component can be expected to respond vigorously though the proposed treatments. In habitat types where Gambel oak is a significant component, “Gambel oak...can resprout prolifically” (Plant Associations of AZ and NM, Volume 1: Forests, pg. 229). More importantly, existing large oaks (5”+ diameter) will be maintained and featured by thinning surrounding trees to reduce competition and increase growth and vigor. Abella and Fulé (2008) found that oak survival was diameter specific 5 years after fall or spring prescribed burning. Survival of oaks greater than 6 inches (15 cm) in diameter exceeded 66 percent at both sites, while survival was low (11 to 20 percent) for small stems less than 2 inches (5 cm) in diameter. Survival may vary depending on operational aspects of burns, such as burn timing or whether oak clumps are deliberately lit. Nonetheless, these data support the findings of Fulé and others that large oaks can be maintained during burns and are consistent with oak’s persistence in frequent-fire pre-settlement forests (Abella and Fulé 2008).

The proposal to burn natural and activity created woody material (slash), either through prescribed or pile burning, within the project area would directly release carbon dioxide during the burning operations. This would contribute to increasing the atmospheric greenhouse gas concentration. However, restoration (or maintenance) of the desired conditions would result in a lower risk of uncharacteristically severe wildfire for those treated acres. This reduced risk has a two-fold effect on GHG emissions or the carbon cycle:

1. There is a direct beneficial effect on climate change of decreased GHG emissions from these acres because the risk of acres being burned by uncharacteristically severe wildfires would be reduced, and
2. There is an indirect beneficial effect by treating these acres because live stands of trees would retain higher capacity to sequester carbon dioxide compared to stands killed by uncharacteristically severe wildfires, especially if not immediately reforested.

It would be difficult to determine the significance of effects of one project on greenhouse gases directly, and therefore climate change indirectly, as there are currently no Federal statutes, regulatory standards, or policy direction on the significance of such effects. Until meaningful, accepted thresholds are adopted against which to weigh any project-related GHG emissions, it would not be possible to determine whether a specific project would have a significant effect under this factor.

Cumulative Effects

Cumulative Effects for the proposed Puerco Collaborative Forest Landscape Restoration Project to vegetation includes past timber sales, timber stand improvement thinning, prescribed burning, wild and domestic grazing, and riparian improvement projects. The geographic setting for the cumulative effects analysis consists of the Puerco project analysis area. The timeframe for past actions is 30 years and 10 years for future and foreseeable projects. These timeframes were chosen because harvested sites have normally grown back to pre-treatment conditions within 30 years, and planning beyond 10 years is speculative. Current vegetation conditions (the affected environment) in the Puerco Collaborative Landscape Restoration area are a reflection of past and present actions, including suppression of naturally occurring fires.

Table 3.1.10. List of Past Timber Harvest & Related Actions occurring within the Puerco Analysis Area, 1987-present

Project Name	Year Completed	Acres
Tree Planting – East of Tampico Spring	1987	64
Commercial Thin – Road 496A, base of McKenzie Ridge	1991	83
Commercial Thin – Smith Canyon	1991	131
Commercial Thin – McGaffey Lookout	1991	56
Group Selection Harvest – Fourmile Canyon	1991	121
Precommercial Thin – Basgal Tank, Road 164	1993	252
Six Mile Timber Sale	1994	786
Sanitation Harvest – Road 496	1994	156
Commercial Thin – Natural Lake	1994	9
Polich Road Timber Sale	1997	3
Tree Planting – Meadow between Basgal & Polich Places	1997	40
Precommercial Thin – 164M Road	1998	178
Forest Road 50 Right of Way	1999	51
Jamestown Thin and Pile	2005	250
Grand Total		2,180

Table 3.1.11. Past Wildfire and Prescribed Burns, Within the Puerco Analysis Area, 1987-present

Fire	Year	Acres
Broadcast Burn – McGaffey Lake	1995	304
McGaffey	1996	25

Puerco Collaborative Forest Landscape Restoration Project
3. Environmental Consequences

Bear	1999	12
Fort Wingate	2005	5
Total Acres		346

Present actions that are occurring within the analysis area include cattle grazing, developed and dispersed recreation, road maintenance, fire suppression, permitted hunting, prescribed burning, and special uses. Specific projects and on-going activities are listed within Table 3.8.

Table 3.1.12. List of Present Actions Occurring Within the Puerco Analysis Area

Project Name	Type of Activities
Berger, Brennen, Cottonwood/Las Tuces, Dan Off, Dent/Dan Valley, Prewitt/6A, Stinking Springs, and Wingate Range Allotments	Cattle grazing, permit administration
Zuni Mountain Trails Project	This decision includes approximately 186 miles of new trails added to the existing trail system and managed for pack and saddle, bicycle, and hiker/pedestrian (not all of which fall within the Puerco Project).
Hunting/Fishing	McGaffey Lake, under permits issued by Arizona Game and Fish
Developed & Dispersed Recreation	Quaking Aspen and McGaffey/Oso Page Campgrounds, McGaffey/McKenzie Picnic Site, Hilso and Strawberry Canyon Trailheads, project area (dispersed).
Annual Road Maintenance	Road grading and maintenance on County Road 50, NM State Hwy 400, and approved Travel Management Decision routes

The Cumulative Effect of vegetation treatments from the adjacent Bluewater Forest Restoration Project will combine to produce a mosaic of different forest stand conditions that will provide resiliency to disturbances, such as wildfire and insect and disease outbreaks. Implementation of the Proposed Action would increase the heterogeneity of the project area and create vegetative conditions that are more resilient to the frequency, extent and severity of disturbances and climate variability, while the No Action Alternative will not meet the purpose and need of the project.

3.2 Fuels and Fire Behavior

Affected Environment

Historically, fire naturally burned throughout the project area relatively frequently, usually within a six year mean interval (Baisan, 1997). These high frequency and mixed severity fires minimized the regeneration of tree and shrub species, leaving a mosaic pattern of tree densities in the pinyon/juniper (P/J) woodlands while in the ponderosa stands an open grassy park-like landscape with large fire resistant trees was typical. This natural process of forest self-management was changed in the 18th century.

Management practices from the 18th century such as grazing, fire suppression, and timber harvesting led to significant impacts on the vegetation and altered the natural fire regime within

the project area. Much of the pine forest in the project area was harvested as evidenced by remnant stumps. This created openings which allowed dense seedling establishment during wet years and no frequent fires to limit the stocking numbers. These events have now produced unnaturally dense stands of suppressed young trees. The historic practices of grazing, fire suppression and timber harvesting have led to the existing conditions of accumulated heavy fuel, and dense forests.

Since the early 1900s, wildfire activity has increased in the Southwest and recent fires have burned at intensities and size rarely seen in the past. This is evidenced in the fire behavior exhibited by the Sedgwick fire in 2004 totaling 8,400 on Mt Taylor RD and the Trigo fire in 2008 totaling 13,709 acres on the Mountainair RD. Also, New Mexico's largest fire, the Los Concha's fire near Los Alamos in 2011, totaled 150,000 acres. And Arizona's largest wildfire, the Wallow fire near Alpine in 2011 totaling 538,049 acres. All 4 of these fires were human caused and destroyed homes.

Fire season in New Mexico usually occurs from early April to late July in most years. It is characterized by low humidity, strong winds and unstable atmosphere. Dry lightning storms are a common occurrence on hot afternoons. Predominate winds are normally from the west-southwest but can change to almost any direction with passing weather cells. Weather records indicate that winds ranging from 8 to 30 mph are typical during the spring and early summer. Based on data over multi-year period and over the 6 months when fire weather is most extreme (March 1st thru August 31st), winds blew predominantly from the south and southwest as opposed to the west. Winds of this speed coupled with low relative humidity and the current fuel conditions can create an environment that supports extreme fire behavior.

Winds coming from the south and southwest would increase the risk of smoke across I-40 and into the local communities of Continental divide, Thoreau, Ft Wingate along with Jamestown that had a past WUI treatment in 2004 approximately 250 acre were thinned and pile burned. Traditionally 60% to 75% percent of the rainfall on the districts occurs July through September when monsoonal moisture generates in the Pacific Ocean follows a thermal trough into the Southwest. The least amount of rainfall occurs from May into early-July when a drier continental air mass resides over the Southwest. This is also the time-frame in which the project area receives its highest visitation.

In addition to fuels and weather, topography such as slope and aspect also influence fire behavior. Slope affects fire spread and intensity. Fire normally burns faster and hotter upslope than down slope or on level ground. Slopes within the Puerco Landscape project area represent a wide range of conditions, ranging between 0 (flat) and 40+ percent. Aspect affects fire spread and intensity based on the direction the slope is facing and the overall vegetation and soil moisture. A south-facing slope is hotter and dryer than a north-facing slope. On a south-facing slope fuels tend to be small and drier and the average relative humidity tends to be lower. Since

the project area lies on the west side of the Continental Divide its weather patterns are slightly different than the east side trending wetter however with changing weather patterns fire behavior would be similar and due to sub drainages and intersecting ridges, all aspects are present.

The Puerco Landscape analysis area has 3 primary Management Areas (MA): pinion /juniper MA13/14, ponderosa pine MA8 and Mixed Conifer MA 10 District fire personnel and contractors conducted fuel transects throughout the project area to gather an overall baseline of tons per acre fuel loading. The findings are that some mortality is occurring due to trees stressed from competition and drought therefore, they are more susceptible to loss from insects and disease. As trees die and fall over, surface fuel loads increase. In these semi-arid systems where rates of biotic accumulation exceed the normal rate of decay fire plays a critical role in recycling biomass (Baisan and Swetnam 1995).

The desired future condition would allow fire to play its natural role in the environment, and be maintained in a manner to alleviate resistance to control. Desired future conditions would mimic natural ecosystem traits, having a diverse mosaic of fuels that are arranged in a fashion not subject to uncharacteristic wildfire.

Pinyon-Juniper Woodland Type

The Pinyon-Juniper Woodland type occupies approximately 41,000 acres of the analysis area. This forest type is typically a mix of pinyon pine and one-seed/Rocky Mountain juniper with scattered ponderosa pine, alligator juniper and gamble oak. The dominant habitat type is Pinyon pine/Blue grama.

There is a high confidence that tree density and canopy coverage have increased in many or most persistent woodlands during the 20th century although the precise magnitude of increase, causes, and geographic applicability are not adequately known. Some of these woodlands are sufficiently open to subdue a running crown fire but dense patches do exist which could sustain this type of fire behavior.

Fuel Model 6 best represents the existing condition of the p/j woodland type. In a FM 6 fires carry through the shrub layer where the foliage is more flammable than fuel model 5, but this requires moderate winds, greater than 8 mi/h (13 km/h) at mid-flame height. Fire will drop to the ground at low wind speeds or at openings in the stand. The shrubs are older, but not as tall as shrub types of model 4, nor do they contain as much fuel as model 4. A broad range of shrub conditions is covered by this model.

Figure 3.2.1. Pinyon-Juniper woodland, note high tree density and continuous vegetative cover.



Ponderosa Pine Forest Type

The Ponderosa pine forest type occupies approximately 25,000 acres of the analysis area. Typically this is the “dry” end of the ponderosa pine type and has scattered pinyon pine and one-seed/alligator juniper as well as gamble/wavy leaf oak. The dominant habitat type is Ponderosa pine/Gamble Oak.

Ponderosa pine in the Southwest experienced low-intensity fires every 5 to 20 years (Covington and Moore 1994). The mature pine was able to withstand low to moderate intensity fires due to their thick bark (Pollet and Omi 2000). These events have now produced unnaturally dense stands of suppressed young trees. This condition threatens any remaining old growth trees through competition and by fueling increasingly extensive crown fires due to vertical continuity of the stand (Covington and Moore 1994, Omi and Martinson 2002). There is a lack of herbaceous understory but plenty of dead pine needles which are a recipe for a stand replacement wildfire under high risk weather conditions. Crown fires in the ponderosa pine type are absent in the historic, local, and regional fire scar records (Touchan and Swetnam 1991), indicating that current stand conditions are an aberration attributable to the three practices mentioned.

Fuel Model (FM) Timber Understory (TL8) best represents the ponderosa pine forest type. The primary carrier of fire in TL8 is moderate load long-needle pine litter, may include small amount of herbaceous load. Spread rate is moderate; flame length low.

Figure 3.2.2. Even-aged Ponderosa Pine Stand, Note dense tree stocking and lack of herbaceous understory



Mixed Conifer Forest Type

The mixed Conifer forest occupies approximately 800 acres of the analysis area. Overall this forest type is just slightly departed from its natural range of variability. Most areas are primarily even aged and lack structural diversity. From a fire risk perspective, this forest type poses no real concern.

Fire Regime Condition Class

To represent the vegetation and fuel loading departure from a historical state, three Condition Classes are used as a qualitative measure. The project area consists of Condition Class 2 and 3, moderate to significantly detached from the historical condition.

Condition Class 1 areas are generally within or near the historical range and do **not** predispose the system to risk of loss of key ecosystem components. Vegetation groups are intact and functioning within the natural range of variability.

Condition Class 2 areas develop as one or more fire return intervals are missed resulting in continued growth of under-story and species reproduction. Vegetation composition and structure have **moderate** departure from the natural range of variability and are predisposed to risk or loss

of key ecosystem components. Fires will burn with greater intensity making them difficult to suppress and will result in changes in biodiversity, soil productivity, and water quality.

Condition Class 3 can be described as **significant** departure from the natural range of variability and predispose the system to a high risk of losing key ecosystem components. Large scale insect damage and disease are usually present, and may become catastrophic while increasing available fuels. Extreme fire behavior is typical with this departure state, and usually will result in a complete stand replacement occurrence.

Condition Class describes the overall vegetative condition of the ecosystem comparing the current condition to historical condition. In addition to describing the condition class, fire regimes categorize major fuel types and the natural fire return interval.

Fire Regime

Five primary fire regime groups have been developed by Hardy et al. (2001) and Schmidt et al. (2002). These are coarse scale and simplified categories that help in understanding the ecological fundamentals of the biotic systems that occur on this landscape, and its previous relationship with fire as a process which acted on them at different frequencies and resulting severities for thousands of years.

Potential vegetative groups have been mapped for the Cibola National Forest and are assimilated with fire regimes. The pure Ponderosa Pine forest type group is most closely represented by Fire Regime III. The remaining Ponderosa Pine acres are a mix of Fire Regime I and II. The Hot Dry Shrub-lands and Woodlands including P/J are represented by Fire Regime II. Finally, the shrub group including Gambel oak is also represented by Fire Regime II.

Fire Regime I: This system includes the lower and mid-elevation forested plant associations, Ponderosa Pine, and Douglas-Fir. These regimes historically had a high fire return interval (0-35 years) preventing high fuel loadings and produced limited layers within the system. The net result was more frequent and less severe fire occurrence.

Fire Regime II: This system is also in the lower to mid elevation range; however it includes grassland plant associations. These regimes have a high fire return interval (0-35 years) with a mix of low and high severity fires. This system includes P/J, mountain mahogany, and other dry mountain shrub species.

Fire Regime III: This system consists of forest plant associations located at mid elevation. Species found there are consistent with higher moisture availability such as Douglas fir, higher elevation bunch type grasses and forbs. The fire return interval is 35 to 100+ years with a mix in fire severity. Stand replacement fire may occur but are usually rare events. This regime is typically a heterogeneous landscape.

Fire Regime IV: This system is characterized by forested species at mid to high elevation. Spruce, and sub-alpine fir plant associations are included within this group. This regime is generally considered as having a fire free period of 100+ years. This usually results in a stand replacement, high intensity fire occurrence.

Fire Regime V: This is a high elevation system, and the plant associations depend upon high local moisture availability. Due to the very long fire return interval in excess of 200 years, this regime is generally considered fire free. Rock, lack of fuels and other combinations of the physiographic setting typically inhibit propagation of fire.

The following table displays the fire regimes and existing condition class within the Puerco Landscape Project Area.

Table 3.2.1. Fire Regimes and Existing Condition Class

Fire Regime Group	Historic Fire Return Interval	Condition Class	Approximate Percentage within project area
I	0 - 35 years	2	5 %
I	0 – 35 years	3	3 %
II	0 - 35 years	2	7 %
II	0 - 35 years	3	75 %
III,IV	35 - 100+ years	Any	10 %

Crown Base Height & Crown Bulk Density

Crown base height (CBH) and crown bulk density (CBD) influence fire behavior, and can be directly managed by thinning or similar forest treatments (Graham and others 1999).

Crown base height is the measurement in feet from the ground to the base of the crown. Often ladder fuels play an important role to establishing a crown fire. Ladder fuels are vegetation arrangements that allow fire to climb up vegetation into the crowns of the over story. Thinning from below and prescribed burning often result in higher crown base heights thus reducing the potential for crown fire initiation. The Project area has numerous pole size trees and areas with abundant regeneration that contributes to heavy concentrations of ladder fuels, thus the risk of a crown fire is high. Using the modeling program, BEHAVE, managers can view the possibility of a fire transitioning from the ground to the crowns called transition ratio.

The transition ratio is the surface fire line intensity divided by the critical surface intensity. If the transition ratio is greater than 1 or equal to, then the surface fire intensity is sufficient for a crown fire. This is important in analysis to show the potential for a crown fire.

Crown Bulk Density is an indicator of the incidence of interlocking crowns which can tell us how a crown fire can spread. CBD is the primary controlling factor of crown fire behavior and it

depends on both species composition and stand density (Graham and others 1999). CBD is measured in lb. per ft. cubed and is the amount of mass in the canopy of a stand. In general, the lower the CBD, the higher the wind speed has to be to sustain a crown fire. CBD's of 0.0104 lb./ft³ and above are considered high. Most of the stands within the project area fall within this spectrum.

Environmental Consequences

It is important to note that fire is boundary-less by nature. There are many elements, some of them discussed within this report, that drive fire growth and spread potential. It is therefore understood that cumulative effects, on site-land management practices, and off-site land management practices are all co-related and overall risk is shared.

Components of fire risk are weather, fuels, and human influences. Fire risk is the potential for a fire to ignite given certain parameters and conditions. Fires start as the result of human activity or naturally by lightning. Lightning caused fires will be looked at on a case by case basis with the core team to see if it's in an area of the project that can be managed for multiple objectives. This would be dependent on multiple things including current weather, logging operations amount of slash, cattle and range concerns, timing of wildlife, fuels moistures and time of year.

Human caused fires account for a low percentage of statistical fires within and directly outside the project area. This will increase due to the implementation of the Zuni Mountain Trail Partnership which is identifying 52 miles of mountain bike and /equestrian trails within the project area thus increasing Human presence and risk of wildfires. If a fire does ignite, there is a high possibility of losing all or most vegetation leaving the land vulnerable to flooding within the watershed. Adverse impacts to water quality would also occur. The soil damage will be detrimental and there is potential for a long-term loss of wildlife habitat. Several communities are in alignment with the local wind pattern, and could be greatly affected by smoke and or impacted by fire.

All forest types were analyzed using baseline weather parameters. Also referencing McGaffey and Bluewater Ridge Remote Automated Weather Station (RAWS). Along with site data and best science practices. The analysis was conducted with three different weather scenarios, Low, Moderate, and High. Base line temperatures and wind speeds were used along with changing fuel moistures in reference to different time of year to show breaking points for crown fire runs.

Table 3.2.2. Fire Attributes Under 3 Weather Scenarios

Attribute	Low Conditions	Moderate Conditions	High Conditions
1-hour fuel moisture%	9	6	3
10-hour fuel moisture %	11	8	5
100-hour fuel moisture %	13	10	7

Puerco Collaborative Forest Landscape Restoration Project
3. Environmental Consequences

Mid flame wind speed (mph)	6	6	6
Air temp	75	75	75

The Behave Plus program was used to simulate and model potential fire effects in the project area. Several fuel models were selected to best represent pretreatment (existing condition) and potential post treatment stand characteristics. Pretreatment and post treatment were calculated for the stand types and compared. Post treatment fuel models were selected that differ from the pretreatment models to include a reduced fuel loading. A reduction in all of the primary categories (rate of spread, flame length, BTU outputs, and scorch height) was observed in the majority of the scenarios that we modeled. For the action alternative the introduction of grass under the canopies and temporary openings increased the rate of spread in some cases, but the intensities and transition ratios decreased below 1. A transition ratio of 1 or above is indicative of conditions that would support a crown fire. As the transition ratio decreases, the crown fire risk also decreases. This is an important value when evaluating fuel treatment effectiveness.

For Ponderosa Pine we used a fuel model TL8, or long needle pine stand, to analyze the existing condition. In the Low scenario we had a high rate of spread and close to the limit on Flame length for initial attack resources to be able to contain but it stayed as a surface fire. The Moderate scenario had a high rate of spread and flame lengths were too high for Initial attack resources to contain we would have to have heavy equipment and air resources brought in but also stayed as surface fire. The High scenario would transition into a running crown fire that could not be contained until transitioned into different fuel type or ran out of fuel. The Ponderosa stands were analyzed for restoration parameters for post treatment scenarios. In both scenarios, a moderate intensity prescribed burn was simulated following the mechanical treatment. In the ponderosa pine scenario the remaining groups were modeled with a fuel model TL4 small downed logs, which best represents post logging operation, and has a lower rate of spread than a TL8 Model, along with lower fire line intensities and heat per unit areas. This leads to much less resistance to control (easier to suppress) for ground resources engaged in fire suppression activities. That modeling also showed similar decreases in the key areas contributing to increased resistance to control as well as crown fire transition ratio.

Pinyon Juniper was modeled with a fuel model 6, moderate to high load dry climate shrub for the existing condition. This model is a shrub model but best represents the characteristics of Pinion Juniper in size and continuity. The PJ stands in all three pretreatment scenarios would transition into a torching crown fire with high transition ratios mainly due to the crown Base height being so low and crown bulk densities being so high. A moderate intensity prescribed burn was simulated following the mechanical treatment. In these scenarios a Fuel Model 8 was used this being a short needled litter. Fire would stay on the surface mainly due to the Crown bulk densities being so low along with fire line intensities and heat per unit area being drastically reduced along with the transition ratio. This would give resources a low resistance of control.

Alternative A – No Action

The No Action alternative would result in no treatment of the existing unhealthy forest vegetation conditions. The forest ecosystem would remain susceptible to the adverse effects of uncharacteristic wildfires consistent with increased population, public use, increased fuel loading, and would be vulnerable to insect/disease outbreaks.

Forest vegetation would continue to grow but at reduced rates due to high tree densities, overcrowding and competition for limited nutrients, water and sunlight. Trees, both on an individual and landscape basis, would continue to be stressed and more susceptible to drought and insect and disease attack. Higher rates of mortality resulting from these causes could be expected. The dramatic increases in stand density and BA over the last 80-90 years represent an increased susceptibility for bark beetle epidemics and stand-replacing wildfire (Margaret M. Moore, et al. 2004).

Stand structure (the horizontal and vertical distribution of forest components including the height, diameter, crown layers, and stems of trees, shrubs, snags and down woody debris) would remain homogenous and uniform.

Recruitment and enhancement of old growth at all scales would continue to occur, although at the current, slower pace; in addition, such areas would be susceptible to uncharacteristic wildfire and/or insect/disease outbreaks.

Stand diversity would remain low and competition for water, nutrients and space would remain high. All developments and resource values in this project area could be lost in a single burning period. From a fire/fuels perspective this alternative is the least desirable.

Table 3.2.3. Ponderosa Pine, FM TL8

Attribute	Low Conditions	Moderate Conditions	High Conditions
Rate of Spread (chains/hr)	6.3	7.8	10.3
Heat per Unit Area (Btu/ft ²)	627	705	832
Fireline Intensity (Btu/ft/second)	72	100	157
Flame Length (ft.)	3.2	3.8	4.6
Transition Ratio	0.60	0.84	1.31

Fuel Model TL8- The primary carrier of fire in TL8 is Moderate load long-needle Pine Litter, may include small amount of herbaceous load. Spread rate is moderate; flame length low.

Table 3.2.4. Pinyon-Juniper, FM 6

Attribute	Low Conditions	Moderate Conditions	High Conditions
Rate of Spread (chains/hr)	3.1	3.7	5.0
Heat per Unit Area (Btu/ft ²)	427	467	562
Fireline Intensity (Btu/ft/second)	24	32	51
Flame Length (ft.)	1.9	2.2	2.8
Transition Ratio	2.93	3.89	6.29

Pinyon Juniper was modeled with a fuel model 6, moderate to high load dry climate shrub for the existing condition. This model is a shrub model but best represents the characteristics of Pinion Juniper in size and continuity. The PJ stands in all three pretreatment scenarios would transition into a torching crown fire with high transition ratios mainly due to the crown Base height being so low and crown bulk densities being so high. Fuel Model 6- Fires carry through the shrub layer where the foliage is more flammable than fuel Model 5, but this requires moderate winds, greater than 8 mi/h (13 km/h) at mid flame Height. Fire will drop to the ground at low wind speeds or at openings in the stand. The shrubs are older, but not as tall as shrub types of a fuel model 4, nor do they contain as much fuel as Fuel Model 4. A broad range of shrub conditions is covered by this model. Even hardwood slash that has cured can be considered. Pinyon-juniper shrub-lands may be represented but may over-predict rate of spread except at high winds, like 20 mi/h (32 km/h) at the 20-foot level.

Alternative B

This action alternative is based on an ecosystem restoration prescription and would have; fewer trees especially small diameter trees that act as ladder fuels and increase the risk of torching, and an open canopy with lower crown bulk density which reduces the risk of sustained crown fire. The ecosystem should be resilient to natural disturbance events including fire, drought, disease, and insect infestations. Measurements such as CBH, CBD, and tons per acre will be used to monitor future conditions of the stand. Treatments such as prescribed burning will be used to maintain the desired conditions based on the measurement pre mentioned. Coupled together these guides and tools will help alleviate undesirable conditions that are present in the Puerco project area currently.

This alternative would create a stand structure reducing the potential for crown fire, although the potential for fine fuels such as grasses increases. Fine fuels could create an environment where ground fire moves faster, but fires would demonstrate low to moderate fire behavior with low resistance to control. This condition would be the case in the majority of the meadows and temporary openings. These areas would serve as randomly placed fuel breaks throughout the

project area. Wildfires within the Puerco project area would be more likely to be contained before they enter private land where we can utilize these fuel breaks.

Crown fires entering the Puerco project area from either private land or National Forest lands could potentially go back to a ground fire giving emergency personnel a chance to safely contain the fire. This would be a direct result from the reduction in canopy bulk density, increase in canopy base height, and creation of the temporary openings. Maintenance of the Puerco project area through selected removal of understory and low intensity prescribed fire would help ensure the effectiveness of this project.

Alternative B would be expected to help protect important values such as private land and current enter structure with recreation sites. In order to protect these values, firefighters must be able to remove the fuel and contain the fire. The shorter the fires duration, the less the potential exists for adverse weather changes or extreme fire behavior that makes conditions less safe for firefighters. There is less exposure to elements such as smoke and terrain. Firefighters can more safely extinguish a fire if it stays small, has lower intensities, low spotting potential, and low resistance to control. Action alternatives will reduce the canopy bulk density and ladder fuels effectively reducing the potential for crown fires creating a safer area for firefighters.

The decision process has many variables, and consideration of all elements must be weighed. Demand for the use of the project areas has changed through the centuries and the greatest unknown factor involves human activities and influences. Substantial evidence does not exist to determine the end risk of the alternative to be selected.

Table 3.2.5. Ponderosa Pine, TL 4

Attribute	Low Conditions	Moderate Conditions	High Conditions
Rate of Spread (chains/hr)	0.8	.9	1.2
Heat per Unit Area (Btu/ft ²)	218	236	280
Fireline Intensity (Btu/ft/second)	3	4	6
Flame Length (ft.)	.8	.9	1
Transition Ratio	0.03	.03	.05

Fuel Model TL4- The primary carrier of fire in TL4 is moderate load of fine litter and coarse fuels. Includes small diameter downed logs. Spread rate is low; flame length low. May include small amount of herbaceous load. Spread rate is moderate; flame length low.

Table 3.2.6. Pinyon-Juniper, FM 8

Attribute	Low Conditions	Moderate Conditions	High Conditions
Rate of Spread (chains/hr)	.9	1.1	1.5
Heat per Unit Area (Btu/ft ²)	165	188	224
Fireline Intensity (Btu/ft/second)	3	4	6
Flame Length (ft.)	.7	.8	1
Transition Ratio	0.34	0.46	0.74

Fuel Model 8- Slow-burning ground fires with low flame lengths are generally the case, although the fire may encounter an occasional “jackpot” or heavy fuel concentration that can flare up. Only under severe weather conditions involving high temperatures, low humidity’s, and high winds do the fuels pose fire hazards. Closed canopy stands of short-needle conifers or hardwoods that have leafed out support fire in the compact litter layer. This layer is mainly needles, leaves, and occasionally twigs because little undergrowth is present in the stand.

Effects Common to Both Alternatives

With the population increase anticipated to continue, it can be expected that the use of the project area will increase at an equal rate. Consideration of increased risk could be managed under the Cibola Fire Management Plan which would restrict or close these areas under extreme fire conditions. Public access into areas currently prohibited or limited under previous decisions would continue as designated.

Managed roads and trails could be effectively utilized for fire-line construction during an emergency or during fuel treatment projects. During fuel treatments, there is increased human activity and equipment that could start fires. However, that can be mitigated by starting the project during favorable weather conditions and limiting it to certain times in the year. An increase of fine fuels (grass) 0-2 tons per acre, can be expected. As stated earlier in this report, grass will reduce the fire intensities and contribute to an overall lower resistance to control.

Cumulative Effects

For this project, the cumulative affects area was considered to be the project area and ongoing or reasonably foreseeable actions that could affect fire and fuels.

Fuel treatment on federal land, specifically Jamestown WUI Fuel Break has reduced the fuel loading on adjacent lands bordering the project area. Prescribed fire was introduced after the fuel wood had been removed.

Implementation of ecosystem restoration projects need to consider the intended recreation usage of the area. A symbiotic relationship exists regarding road and trails. One of the unintended results of fire-line construction or creation of fuel-breaks often result in increased traffic and user created routes that require mitigation or obliteration.

Conversely, valued and managed recreational routes are usually located geographically and topographically so that they allow easy compartmentalization of areas without having to construct new fire-line. Under Alternative A, the overall fuel load in the project area will not be reduced and resources in the area will continue to be at risk for intense, difficult to control fires. Under Alternative B, the proposed activities will be instrumental in fuel reduction and progressing the project area toward Condition Class 1 (low risk of losing key ecosystem characteristics due to wildland fire).

Air Resources

The affected environment within and surrounding the project area meets air quality standards for the six criteria pollutants, so is not listed as a “non-attainment” area (USEPA 2012). As defined by the Clean Air Act, a non-attainment area is one that does not meet the standards for one or more of the six criteria pollutants. Air quality in the area is considered to be very good, typically well below standards set by EPA and NMED to protect human health and the environment. The area meets all air quality standards and there are no nonattainment areas nearby.

Elevated PM_{2.5} concentrations can be attributed to both prescribed fires and wildfires, such as those that have occurred in the area over the last several years. Communities closest to the fire typically experience the greatest impacts. Wildfires often have greater impacts than prescribed fire, both in terms of concentrations and duration of impacts of PM_{2.5} concentrations. While generally, the area has very good air quality in terms on particle pollution, there have been localized incidences of unhealthy air quality from associated from both wildfire and prescribed fire in the past several years.

Ozone is a secondary pollutant that forms as a result of chemical reactions in the atmosphere when the primary pollutants of nitrogen oxides (NO_x) and Volatile Organic Compounds (VOC) are exposed to sunlight. The precursors to ozone are generally produced as emissions from combustion of fossil fuels. Sources in this area include refineries near the Continental Divide along I40, engine exhaust from oil and gas development, and mobile sources including cars, trucks and recreational vehicles. Smoke from wildland and prescribed fire does contain precursors for ozone, and fire smoke has been known to contribute to increased ozone concentrations under certain conditions (Jaffe 2012).

Visibility relates to conditions that allow humans to see and appreciate the inherent beauty of the landscape features, and these conditions can be greatly impacted by particular matter and gasses that are in smoke or dust. Visibility and other air quality standards are most stringent within

designated Class 1 areas. The closest Class I area is the Petrified Forest National Park, located to the west, upwind of the project area.

Summary of environmental impacts by alternative

The primary environmental impacts to air quality analyzed in this assessment are emissions from prescribed fire. To distinguish between alternatives, the maximum acres of the project area that could have prescribed fire applied are listed for each alternative. The main differences between alternatives relevant to this assessment are: the number of acres that could have prescribed fire; whether the acres have been harvested prior to using prescribed fire or not; and the type of vegetation on each acre treated by prescribed fire. For this assessment, approximately 57,875 acres are proposed for treatment with prescribed fire in the action alternative. Of these acres, 85% are proposed to be treated by mechanical methods prior to prescribe burning. On average, 10% or more of the total acres could be treated each year with prescribed fire, about 5,790 acres. In contrast, wildfire's total acres and related emissions could exceed that of the action alternatives. A wildfire would burn without the benefit of planning and meeting conditions more favorable to protecting sensitive receptors. The proposed alternative is expected to reduce the intensity of wildfire should it occur in the project area.

Table 3.2.7. Vegetation Type and Acres of Prescribed Fire

Vegetation Type	Mechanical with Prescribed Fire	Prescribed Fire Only	Total Treatments with Prescribed Fire
Dry Mixed Conifer	263	212	475
Ponderosa Pine	19,423	3,481	22,904
Ponderosa Pine-Gambel Oak	10,908	3,045	13,953
Pinyon-juniper Woodland	875	225	1,100
Ponderosa Pine/P-J Transition	10,209	1,285	11,494
Grassland/Shrubland	7,671	33	7,704
Riparian Meadow	21	0	21
All Vegetation Types	49,370	8,281	57,651

Cumulative Effects

The analysis area for considering cumulative smoke related effects are the airsheds that intersect the project area. The relatively short term duration of smoke emissions from this project would not affect long term air quality in the area, and may mitigate the effects on air quality from a wildfire.

Cumulative effects include those from past, ongoing and reasonably foreseeable future activities that combine with effects of the proposed project in contributing to the total particulate matter, carbon dioxide, and ozone load in the same airshed. Generally, the cumulative effects analysis area lacks large industry capable of contributing significant PM or carbon dioxide. While the other potential sources of these pollutants cannot be accurately quantified, they are as follows:

- Use of fireplaces and wood stoves contributes PM and CO₂ mostly from November-April.

- Dust from unpaved roads does not typically travel very far or contribute large amounts of PM.
- Industry emissions are a negligible contribution.
- Prescribed burning by agencies and private landowners are a common contribution of PM and CO₂.
- Wildfires usually occur annually and contribute relatively large amount of PM and CO₂.

Thus, emissions from prescribed burning activities outside of the project area, but within or near the same airshed, in addition to emissions from the various other sources, and the existing PM and CO₂ in the air from past activities, would increase the amount of pollutants that would be distributed to areas downwind. Of these sources of PM and CO, prescribed burning and fireplace smoke are the most common and would be the primary contributors to cumulative air quality effects. Fall and winter burning of slash piles in the project area and in the surrounding forests would contribute incrementally to the cumulative smoke effects from residential use of wood stoves and fireplaces. Cumulative effects from prescribed burning would be mitigated through coordination with other prescribed fire projects and NMED, so that multiple prescribed burns do not affect the same airshed at the same time, if they were determined to cumulatively result in significant impacts.

Fine particulate emissions from the proposed action combined with other sources would add to the regional haze that results when there are multiple sources of emissions during the same time period. During temperature inversions, the haze becomes concentrated near the surface. Proposed actions would contribute an insignificant amount to the regional haze and overall air pollution load within this airshed, in part due to the timing, coordination and monitoring, low emissions concentrations, and other mitigation measures previously described. Although burning could occur any time throughout the year, a higher percentage of the broadcast prescribed burning would likely occur in the spring or fall rather than during the winter when residents use wood-burning stoves/fireplaces and there are more air inversions. Piles burned during the winter months would involve timing restrictions to allow for adequate smoke dispersal. To further reduce cumulative effects to air quality, prescribed burning would be coordinated between Federal land managers and the State regulatory agency so as not to overwhelm the air resource. The State would regulate and decide if and when burn permits are issued to the Forest Service and others in order to avoid cumulative effects that might exceed air quality standards. Thus overall, the cumulative increase in emissions from this project is not expected to be significant enough to approach concentrations that would exceed State or Federal air quality standards.

Conclusion about effects

Emissions on the Cibola National Forest and National Grasslands are regulated by the New Mexico Environment Department, Air Quality Bureau. All prescribed burns would comply with New Mexico's Smoke Management Program. Prescribed burning would be restricted on days with less than good ventilation conditions and emission reduction techniques (ERTs) would be required. As a result, the effects to air quality would be minimized due to the reduction of emission produced. In addition, due to the potential to have significant health impacts to communities downwind and down drainage from prescribed fire, communication and coordination would be required prior to the implementation of any prescribed fire project.

No smoke would be generated from thinning or wood and slash removal; however, there would be other minor impacts to air quality by these activities, such as fugitive dust and exhaust from vehicles, heavy equipment, and chain saws. The levels of exhaust are anticipated to fall well

below EPA emission standards. Road dust would be higher than current conditions during these activities unless they are conducted while the ground is frozen or the road is moist. Constructing, maintaining, and decommissioning roads would also stir up dust; however, this kind of dust settles fairly quickly, can be mitigated with dust abatement techniques, and is limited spatially.

Based on typical daytime winds in the area, smoke would likely move toward the northeast and would likely dissipate during the periods of active burning. During the daytime burns, the amount of smoke generated would tend to be greatest for a few hours in the late afternoon when the fire is hottest. However, people in the surrounding areas would likely see smoke in the air. Based on past prescribed burns in the same area, it could be expected that individual projects under each alternative have the potential to cause short term impacts in communities downwind of the projects. These impacts decrease the further away from the project area a community is located.

Emission reduction techniques would be used to reduce the actual amount of emissions produced from fire, where appropriate, to aid in the maintenance of air quality. For broadcast burning, the following techniques could be used:

- Burning could occur with higher fuel moistures in the larger fuels so that they are not readily consumed. Based on estimates by research compiled by the Western Regional Air Partnership (WRAP 2018) this could reduce emissions by 43%.
- A backing fire could likely be utilized for significant portions of the burn area. WRAP (2018) estimates shows that this can reduce emissions by up to 45%.
- Aerial Ignitions could also be employed which WRAP (2018) estimates show can reduce emissions by 10%, due to the efficiency in the burn.

Mechanical treatments, thinning, and harvesting can reduce the amount of fuels available to be burned, which in turn can lead to lower emissions, when biomass is removed. Mechanical treatments, thinning, and harvesting can also lead to higher emissions, when those areas are subsequently burned after treatment due to the higher amount of fuel available after these types of treatments. Non-burning alternatives would achieve fuels treatments while mimicking prescribed burning efforts. The following methods could be used to achieve this goal for both alternatives:

- Cut material could be piled to allow for most complete consumption of particulate matter.
- Material could be hauled offsite and utilized for woody products to reduce the total volume of material burned.

Climate and Climate Change

The project area is located in Cibola and McKinley Counties, New Mexico. In the area covered by this analysis, precipitation seasonality varies due to the influence of the Arizona monsoon (a.k.a., the southwest monsoon). Areas affected by the southwest monsoon receive greater amounts of summer precipitation from moist air masses derived from the Gulf of Mexico and Gulf of California. Most of the annual precipitation comes in the form of rain originating from convective thunderstorms during the months of July through September. Higher elevations of the analysis area may also receive some cool season moisture in the form of snow. In addition to temporal variability of precipitation, spatial variability of precipitation is also a characteristic within the analysis area. Topography and storm type are two factors that control the spatial

variability of precipitation. At the local scale, precipitation tends to increase with elevation due to the effects of orographic lifting. Summer precipitation tends to have more spatial variability than winter frontal storms.

Data from the nearest weather station (Bluewater Ridge) show that the mean maximum January temperature is approximately 42 degrees F, the mean maximum July temperature is approximately 82 degrees F, and total annual precipitation is approximately 15 inches (RAWS USA Climate Archive). Precipitation patterns vary over the course of the year, with the largest peak in precipitation typically occurring in the summer along with the North American Monsoon. The project area is also characterized by a high degree of interannual variability of precipitation; a number of annual to multiyear droughts and wet periods are documented in the climate record (Rother & Grissino-Mayer 2014)

Droughts are common in New Mexico due to the overall low amount of annual precipitation and the previously described spatial and temporal variability of that precipitation. Regional precipitation patterns are regulated by global scale fluctuations in ocean surface temperatures. Over the long term, the Pacific Decadal Oscillation (PDO) tends to influence the precipitation regime in this part of New Mexico. Studies of 20th century precipitation patterns show that there have been three distinct precipitation regimes. The first was a relatively wet period from 1905 to 1941. Next was a period of dry from 1942 through 1977. This was followed by a period of wet from 1978 through 1998. The years since 1998 have marked a shift back to a dry period and suggest that we could be in for another 1-3 decades of drier than average conditions. This information has important implications on ecosystem management due to the influence of precipitation on disturbance regimes and the capacity of ecosystems to resist or recover from those disturbances.

Globally, the Earth's surface temperature has increased by about 1.2 °F to 1.4°F since 1900, with most of the warming occurring in recent decades. Anthropogenic gases, particularly CO₂, are enhancing the natural greenhouse effect, and likely contributing to an increase in these global average temperatures and related climate changes (EPA 2010). CO₂ and other pollutants enter the atmosphere through the burning of the fossils fuels (oil, natural gas, and coal) that we depend on to meet our daily energy needs.

The potential effects of climate change on the environment would vary spatially. A study done by the Agency Technical Work Group (2005), in accordance with Executive Order 05-033, projects major environmental implications for the State of New Mexico from a changing climate. The agency has predicted some of the following environmental consequences in New Mexico if temperatures continue to rise at the current, "business-as-usual" rate:

- Average air temperature substantially warmer by 6°F–12°F
- Greater warming for winter, nighttime minimum temperatures, and higher elevations

- More episodes of extreme heat
- Fewer episodes of extreme cold
- Longer frost-free period
- Changes in average precipitation are uncertain, precipitation could increase or decrease
- More extreme events (torrential rain, severe droughts)
- Continuation of historical patterns of wet and dry cycles, including likely recurrence of multi-year drought
- Winter rain instead of snow at all but highest elevations

Impact of Climate Change on Fire Frequency and Severity

Climate change has played an extensive role in altering fire occurrence and severity by influencing the vegetative cover and available burnable fuel across the western landscape. In the past few years, fires have grown to record sizes, are burning earlier and longer, and are burning hotter and more intensely than they have in the past (Westerling et al. 2006). According to the National Interagency Fire Center, occurrence of uncharacteristic wildfires greatly increased over the last 20 years. Westerling et al. (2006) claim that a study of large (>1,000-acre) wildfires throughout the western United States from 1970 to 2003 saw a pronounced increase in frequency of fire since the mid-1980s. Fires from 1987 to 2003 were four times more frequent than the 1970–1986 average. After 1987 the length of the fire season was also observed to increase by 78 days.

Changes in relative humidity have been blamed for much of the changes as increased drying over much of the southwest has led to an increase in days with high fire danger (Brown et al. 2004). Advanced computer models are now making national scale simulations of ecosystems providing predictions of how fire regimes would change in the twentieth century (Neilson 2004). Predictions are that western grasslands would undergo increased expansion of woodier vegetation such as piñon-juniper associated with increased precipitation occurring during typical wet seasons. Summer months are predicted to be hotter and longer, which would also contribute to increased fire risk (Neilson 2004). Under greater climatic extremes widely predicted throughout the U.S., fire behavior is expected to become more erratic, with longer flame lengths, increased torching and crowning, and more rapid runs and blow-ups associated with extremely dry conditions (Brown et al. 2004).

In a General Accounting Office report on climate change and federal lands, natural resource experts from numerous federal and state agencies and leading academic experts predict that climate change would cause forest fires to grow in size and severity (General Accounting Office 2007). This in turn would impact the safety of communities located not just in the WUIs but in even larger areas as a result of impaired air quality resulting from vast smoke production. The cost of fire suppression and the expense of fire preparedness is likely to increase in parallel with

increasingly larger fires. Experts warn that Southwest fire and fuels management strategies and policies need to address these risks now in order to prepare for these changing regimes, while also accommodating complex changing ecosystems subject to growing human stresses (Brown et al. 2004).

Since Southwestern forest environments and ecological processes are influenced by climate, we need to be prepared to learn and understand changes in climate and ecosystem processes and function, and to employ adaptive management strategies to accommodate such changes over time. Although fire suppression is still aggressively practiced, fire management techniques are continually adapting and improving. Due to scattered human developments and values throughout the WUI, suppression would always have to be a priority in those areas. However, combining prescribed fire with effective fuels management and restoration techniques would help re-establish natural fire regimes and reduce the potential for uncharacteristic wildfires associated with our changing climate.

3.3 Soil

Affected Environment

Soil conditions in the project area were assessed using the Cibola Terrestrial Ecological Unit Inventory (TEUI) (Strenger et al. 2007) and field observations. The survey consisted of a soil survey and site characteristics (climate, geology, slope, aspect, surface components, and vegetation) mapped using established protocols. TEU is used to provide the initial ecological base for developing ecosystem management plans at the Forest or project level because it provides information about what a site's potential natural is, including vegetation, canopy cover, and surface components such as bare ground. This data includes plant composition for tree, shrubs, forbs, and graminoids (grass, sedge, etc.), including canopy for each type. While the TEU data generally describes a desired condition that is likely to occur on a site, variations are possible. Field observations taken in 2012-2017 were used to verify data at locations across the project area.

Interpretations have been developed using appropriate attributes from the TEU data to assist in analysis. Soil condition and erosion hazard rating are of particular use to determine project activities. Soil condition is used to assess where restoration activities are needed to improve soil conditions. Active rills and gullies, pedestaling, exposed roots, lack of top soil (A horizon) have been observed in the project area. Bare ground and lack of woody material and litter often contribute to less than satisfactory soil conditions in the project area.

Table 3.3.1 summarizes TEU map units in the vegetation treatment areas and their related soil condition and erosion hazard ratings of the most limiting component within the TEU unit. Figure 1 is a map of the TEU map units in the project area.

Puerco Collaborative Forest Landscape Restoration Project
3. Environmental Consequences

Table 3.3.1. TE Units in the Puerco Analysis Area

Map Unit	Acres	Percent	Erosion	Condition	Potential Natural Vegetation
1	1,764	2.18	Moderate	Impaired	Shrub Meadow – rubber rabbitbrush
2	22	0.03	Moderate	Impaired	Shrub Meadow – rubber rabbitbrush
10	807	1.00	Severe	Unsatisfactory	Shrub Meadow - winterfat
11	2,109	2.60	Moderate	Impaired	Shrub Meadow - sage
31	3,869	4.78	Moderate	Impaired	Shrub Meadow – rubber rabbitbrush and snakeweed
33	2,548	3.15	Slight	Impaired	Ponderosa pine 25% Oak 15% Juniper 6%
153	5,586	6.90	Slight	Impaired	Ponderosa pine 25% PJ 25%
154	7,056	8.71	Moderate	Impaired	Ponderosa pine 15% PJ 17%
155	845	1.04	Severe	Unsatisfactory	Ponderosa pine 15-30% Oak 5% Juniper 6%
156	3,703	4.57	Slight	Impaired	Ponderosa pine 25% Oak 2% Juniper 3%
157	6,888	8.51	Slight	Impaired	Ponderosa pine 15% Juniper 2% Oak - trace
158	2,940	3.63	Moderate	Impaired	Ponderosa pine 20% Juniper 2% Oak - trace
159	612	0.76	Moderate	Impaired	Ponderosa pine 20% Juniper 2% Oak – 5%
166	8	0.01	Severe	Satisfactory	Ponderosa pine 10% Juniper 8%
184	542	0.67	Severe	Satisfactory	Pinon 10% Ponderosa pine 2% Douglas fir 5% Juniper 2%
185	10,187	12.58	Severe	Unsatisfactory	Ponderosa pine 10% Juniper 5-15%
189	8,855	10.94	Slight	Impaired	Ponderosa pine 25% Juniper 1% Oak - trace
190	3,028	3.74	Slight	Impaired	Ponderosa pine 40% Juniper 2% Oak – trace

Puerco Collaborative Forest Landscape Restoration Project
3. Environmental Consequences

191	68	0.08	Severe	Satisfactory	Douglas fir 20% Ponderosa pine 15% Oak - trace
192	50	0.06	Severe	Satisfactory	Douglas fir 55% Ponderosa pine 5% Juniper 1% Oak - trace
193	1,340	1.65	Slight	Impaired	Ponderosa pine 10% Pinon 5% Juniper 5% Oak - trace
194	1,048	1.29	Moderate	Impaired	Ponderosa pine 25% Pinon 8% Juniper 23% Oak - trace
197	136	0.17	Moderate	Satisfactory	Douglas fir 65% Ponderosa pine 5% Juniper 1% Oak – trace Aspen
198	7,929	9.79	Severe	Unsatisfactory	Pinon 5% Juniper 15% Fragrant ash Oak
255	1,097	1.36	Severe	Unsatisfactory	Douglas fir 15% Ponderosa pine 5% Juniper 2% Oak - trace
274	1,636	2.02	Severe	Unsatisfactory	Ponderosa pine 25% Pinon 3% Juniper 6% Oak - trace
275	4,452	5.50	Moderate	Impaired	Ponderosa pine 20% Pinon 5% Juniper 5% Oak - trace
301	1,098	1.36	Slight	Impaired	Ponderosa pine 25% Juniper – trace Oak - trace
311	96	0.12	Slight	Impaired	Ponderosa pine 15% Juniper 2%
312	657	0.81	Moderate	Impaired	Ponderosa pine 30% Juniper 1% Oak - trace

Soil Condition ratings are tied to a given soil type found within the Terrestrial Ecological Units (Strenger, et. al. 2007)). Table 1 lists the soil condition within the project area as indicated

through the TEU inventory. Figure 2 is a map of soil condition classes within the project area. Soils were classified into three condition groups; Satisfactory, Impaired, and Unsatisfactory.

- **Satisfactory** – Soil function is being maintained and is operating as expected.
 - **Impaired** – Ability of the soil to function properly has been limited or it has less resistance to the forces of degradation. Changes in management or mitigation measures may be appropriate.
- Unsatisfactory** – Loss or degradation of vital soil functions have occurred resulting in the inability to maintain resource values, sustain outputs and recover from impacts. Soils rated in this category are candidates for improved management or active restoration designed to recover soil functions.

Soil condition is an evaluation of soil quality based on the interrelationship between soil hydrology, soil stability, and nutrient cycling. Soil hydrology is assessed using compaction. Compaction occurs on and adjacent to roads, trails, and recreation areas in the project area. Compaction reduces the ability of the soil to absorb, store, and transmit water. Soil stability is assessed through the erosion hazard rating and existing conditions on the ground. Nutrient cycling is assessed through levels of woody material which exist since wood is an important factor in maintaining soil organic matter. Soil condition integrates these three factors categories to come up with a soil condition rating. Soil condition ratings for this project area were determined using guidelines found in the Technical Guidance document (USDA 2013).

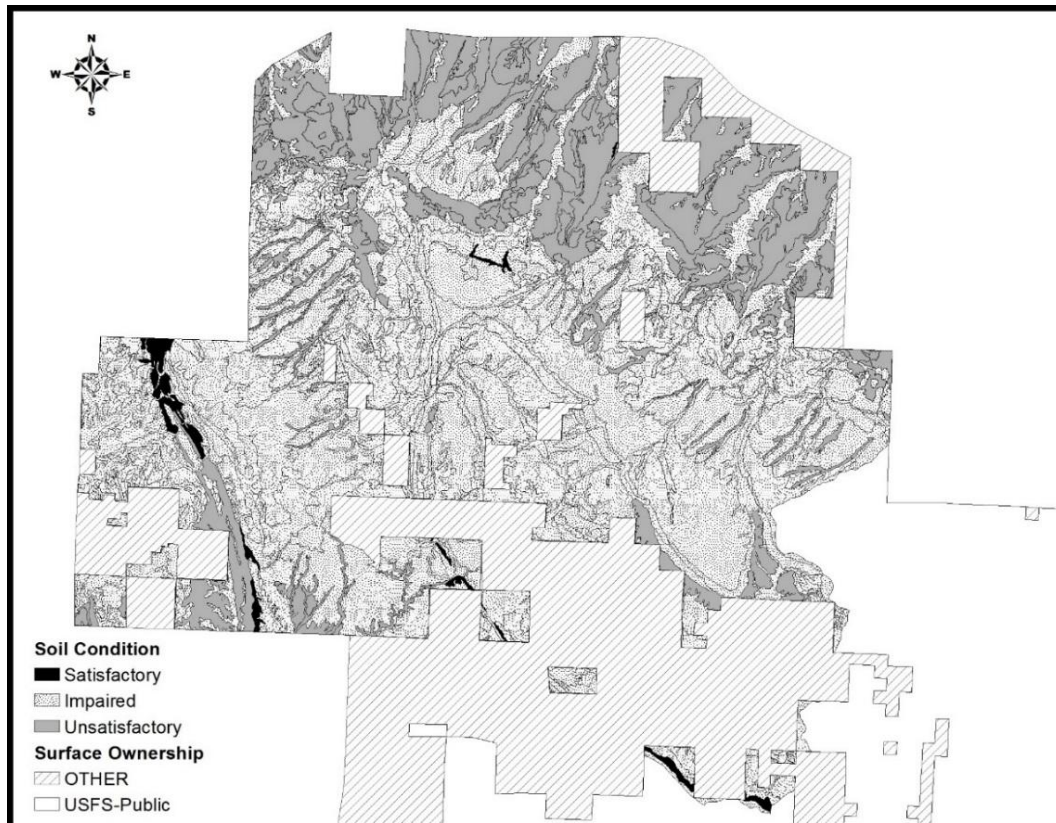
Table 3.3.2 lists the soil condition ratings in the project area and treatment area. Figure 3.3.1 shows locations of soil condition categories. Impaired and unsatisfactory soil conditions occur across most of the project area.

Table 3.3.2. Summary of Soil Condition

Soil condition	% of Analysis Area
Satisfactory	1.1
Impaired	68.8
Unsatisfactory	30.1

Where soils are currently impaired or unsatisfactory, bare soil resulting in high erosion rates and lack of woody material on the ground are the main causes. High erosion rates are related to the lack of ground cover, litter, and woody material in addition to compacted surfaces related to roads and trails. In the pinon- juniper forest type, the loss of biotic crusts is widespread and bare soil is a higher percentage of the surface than is natural. Where woody material is lacking, historic use and past management practices are the main causes. In particular, large woody material greater than 16 inches in diameter is lacking in many areas, including wood that is in an advanced state of decay. This type of wood provides nutrients to the soil and habitat for soil biota.

Figure 3.3.1. Soil Condition in the Puerco Analysis Area.



The erosion hazard interpretation determined from the TEU data provides important information that helps determine the treatment methods that consider soil stability. Erosion hazard is based on the potential for soil loss from complete removal of vegetation and litter (USDA 1986). A severe rating indicates areas where mitigations are unlikely to prevent losses in soil productivity. Soils rated as moderate must be mitigated to prevent losses in soil productivity. Soils rated with a slight rating usually stabilize under natural conditions once the disturbance is removed.

Environmental Consequences

The analysis area for soil condition is the analysis area boundary. This is because it is the soils within this area have the potential to be directly and indirectly affected by the proposed activities. The measures for soil condition are acres of disturbance from vegetation management activities, and the heat per unit area and transition ratio, as modeled at the surface, listed in Table 3.3.3. The heat per unit area at the surface provides information about the heat the soil would be subject to during a wildfire under the modeled scenarios of the alternatives. The transition ratio is an indicator of the susceptibility for crown fire. Crown fire is associated with severe wildfires that are very hard to control with high intensity. Severe wildfires result in greater amounts of damaged soil. The amount of woody material on the ground is a useful measure since lack of woody material has been observed and measured across the project area. Soil disturbance is an indicator where the soil is disturbed, resulting in soil loss and erosion. Soil disturbance could

Puerco Collaborative Forest Landscape Restoration Project
3. Environmental Consequences

occur from vegetation management activities, restoration activities, range projects, and road work. Range projects and road work are occurring within areas where soil disturbance is already occurring, so these effects will not be carried through the analysis. The time period for soil disturbance related to vegetative treatments, restoring unauthorized roads, and restoration projects is 10 years since this time period allows time for a trend related to soil changes to be observed.

Table 3.3.3. Activities with the Potential to Effect Soil Condition with Measures

Activity	Direct and Indirect Effects	Measures
Vegetation Treatments Mechanical thinning Hand thinning Mastication Removal of wood Slash piles Motorized equipment use	Compaction Erosion	Acres disturbed by motorized vehicles Acres of slash piles
Vegetation Treatments Woody material added	Improve soil condition Improve ground cover Improve nutrient status	Acres with woody material increased
Road Projects Decommission unauthorized	Close to motorized access Stabilize	Acres of decommissioned roads
Fire Prescribed fire Pile burning	Soil heating Loss of surface litter, vegetation Improve fire condition	Modeled heat per unit area Transition ratio
Water resource improvements Springs, stream, riparian restoration Headcut treatments Fence riparian areas	Improve ground cover Improve nutrient status Decrease compaction Reduce erosion	Acres of water resource improvements

Treatment types for vegetative treatments take into consideration slope, distance to road, erosion hazard rating, soil condition, and type of vegetation. These factors were used to determine cutting method, removal of wood (if any), slash disposal, and fire options. In this way, mitigation measure are part of the project design to prevent effects to soil resources.

Alternative A – No Action

Under the No Action Alternative none of the proposed activities would occur. There would be no direct effects on soil resources, such as ground disturbance or loss of tree cover. Locations where erosion is occurring such as roads and trails, both designated and user-created, will continue to contribute to soil loss. Areas where soil condition is less than satisfactory due to lack of woody material will remain in this condition. Recruitment of large woody material is likely to occur as trees die. Where riparian areas and springs are functioning at less than proper functioning

condition, these conditions would continue to occur without the proposed restoration activities working to improve these features.

The greatest effect of no action is the effects of uncharacteristic wildfire, an indirect effect. As discussed in the Fuels Report, under this alternative, the forest ecosystem would remain susceptible to the adverse effects of uncharacteristic wildfires without improved control options as provided by the action alternatives. Wildfires would be harder to control and burn hotter as indicated by the heat per unit area at the surface and transition ratio. Currently, the modeled surface heating in the high weather conditions varies from 837 Btu/ft² in the ponderosa pine type, and 562 Btu/ft² in the PJ. These heating levels could lead to temperatures well above the values where organic matter is destroyed, amino acids are lost, and nitrogen is volatilized (Hungerford et al 1990). In both vegetation types, there is a susceptibility to crown fire as indicated by the modeled transition ratios of 6.29 in the PJ type and 1.31 in the ponderosa pine type. Potential fire related effects include soil hydrophobicity, altered infiltration, increased runoff, sedimentation and erosion. Nutrient cycling is also changed by heating of both organic and inorganic compounds. The effect would be dependent on fire behavior, but soils are likely to be heated changing the physical and biotic characteristics of the soil. With high burn severity, soils may also become water repellent which increases runoff during storm events because water is not able to infiltrate.

There would be no direct effects on soil resources, such as ground disturbance or loss of tree cover. Locations where erosion is occurring such as roads and trails, both designated and user-created, will continue to contribute to soil loss. Areas where soil condition is less than satisfactory due to lack of woody material will remain in this condition. However, natural recruitment of woody material is likely to occur as trees die, thereby contributing to down woody material and improved ground cover.

Alternative B

Vegetation Treatments

Under this alternative, the activities of removing trees, adding woody material to the ground, prescribed fire including the potential for pile burning and driving on soils to remove wood products, could lead to direct effects to soil resources. These direct effects include compaction, bare ground, and loss of soil productivity. Creating the proposed openings could result in soil disturbance from mechanized equipment, removal of trees, mastication, and prescribed fire. Removing trees and soil disturbance exposes soil to precipitation events leading to erosion and sediment transport. In addition, there are changes in microclimate site occur when canopy and ground cover are disturbed or removed.

Soil disturbance would be reduced or prevented in some areas through design features and best management practices (BMPs) as described in Chapter 2 and Appendix D. The development of

treatment types utilized information about soil conditions to determine proposed activities as shown in Table 2.2.1 (refer to table in chapter 2).

By considering soil characteristics, project design features protect soil productivity by avoiding and reducing impacts to sensitive soils and improving soil characteristics. Where soil condition is unsatisfactory, soil disturbing activities are not proposed, except for prescribed fire. Woody material may be added in these areas if it is lacking through hand treatment methods. Woody material in all size and decay classes improves soil condition where lacking. This wood provides protection to soil during rainfall, provides nutrients and microclimate, supporting soil processes. Where slopes are greater than 40%, motorized vehicles would not be allowed. Field observations reveal that motorized personal fuelwood collecting disturbs a large percentage of the area. As a result, personal fuelwood collecting is proposed for areas where soil condition is satisfactory and erosion hazard is slight to moderate. Masticated material is generally left in the openings and may be burned in later years. The depth of masticated material would not exceed 4 inches and would be discontinuous. Down woody material would be retained and/or appropriate levels would be restored after proposed activities to ensure appropriate levels to maintain soil quality are present. In areas with impaired or unsatisfactory soils, woody material will be left to improve soils since woody material on the ground is lacking in most areas. These activities would work to improve soils on 62,331 acres.

Driving on soils and the use and maintenance of roads related to the proposed action would cause compaction and increased sediment yields in these areas. Compaction quickly occurs during the first few passes across soil, and in the P-J zone cryptogamic crusts are destroyed. Existing roads are already compacted, however when masticators or other equipment is used off road to remove trees, compaction occurs quickly. Motorized vehicles also compact soils. This effect could occur in treatment types 1, 2 and 3 (see Table 2.2.3. Proposed Vegetation Treatments and Treatment Types, page 42) from access by motorized vehicles, including masticators. As a result, about 15% of these areas could have visible tire tracks and compacted surfaces (Cline, et al 2010). A similar assumption is made for personal fuelwood use collection since these areas are designed to be close to existing roads, thereby reducing the need for off road motorized access.

Therefore, for the purposes of analysis, it is assumed that the 15% of treatment types 1, 2, and 3 could be subject to ground disturbance when mastication or mechanized fellers are used. As a result, up to 6,949 acres could have impacts from motorized uses on them, including large equipment such as masticators, mechanized fellers, pickups, or ATVs. These area will be restored after activities where soil does not readily recover on its own. Restoration activities could include adding wood, seeding, mulching, erosion control, and other practices that stabilize and restore soil productivity.

Research suggests that thinning can increase nitrogen transformations into available nitrogen (Kaye and Hart 1998) but that repeated prescribed burning for maintenance may result in

increased nitrogen mobility (Wright and Hart 1997), leading to nitrogen losses from soils. Results from research on mastication and soil suggest that masticated material can reduce soil temperatures and increase soil moisture (Owen et al 2009). Over time, mastication may negatively affect nitrogen dynamics (Gottfried and Overby 2011). The same study showed that pile burning increases soil temperatures, reduces soil moisture, changes soil structure, and causes nitrogen to be leached away. Because of these effects, areas proposed for mastication will have limits on the amount and spatial distribution of masticated material. Limits on piles and specifications for their construction are also part of the mitigations to protect soil.

Pile burning would only be used when wood loads are too great to be treated any other way. Piles are proposed as a possible treatment method for slash in treatment types 1, 2, 3, and 5 (see Table 2.2.3., page 42) except where soils are in unsatisfactory condition or have severe erosion hazard potential. Piles would not exceed 10 feet by 10 feet and up to 30 piles per acre. Additional mitigations are listed in the BMP appendix. This could result in 327 acres of soils impacted below these piles. If pile burning occurs several best management practices would be used to mitigate the effects to soil such as burning piles in the winter as described in the BMP appendix. Despite mitigations, management actions are like to be needed to restore the soil below piles. These actions include seeding, mulching, and erosion control.

The indirect effect of improving controllability of uncharacteristic wildfire behavior as a result of the proposed vegetative treatment is a benefit to soil resources. Thinning activities are a preferable alternative to wildfire, resulting in less impact to watersheds (Ffolliott, et al 2011 and Dore et al 2010). The fuels report lists the results of fire behavior model, BEHAVE Plus, for this alternative. This model shows that when weather conditions are severe the model results for heat per unit area at the surface are reduced in the ponderosa pine and piñon-juniper types. In addition, the proposed treatment reduce the transition ratio to less than 1, meaning the risk of crown fire become unlikely.

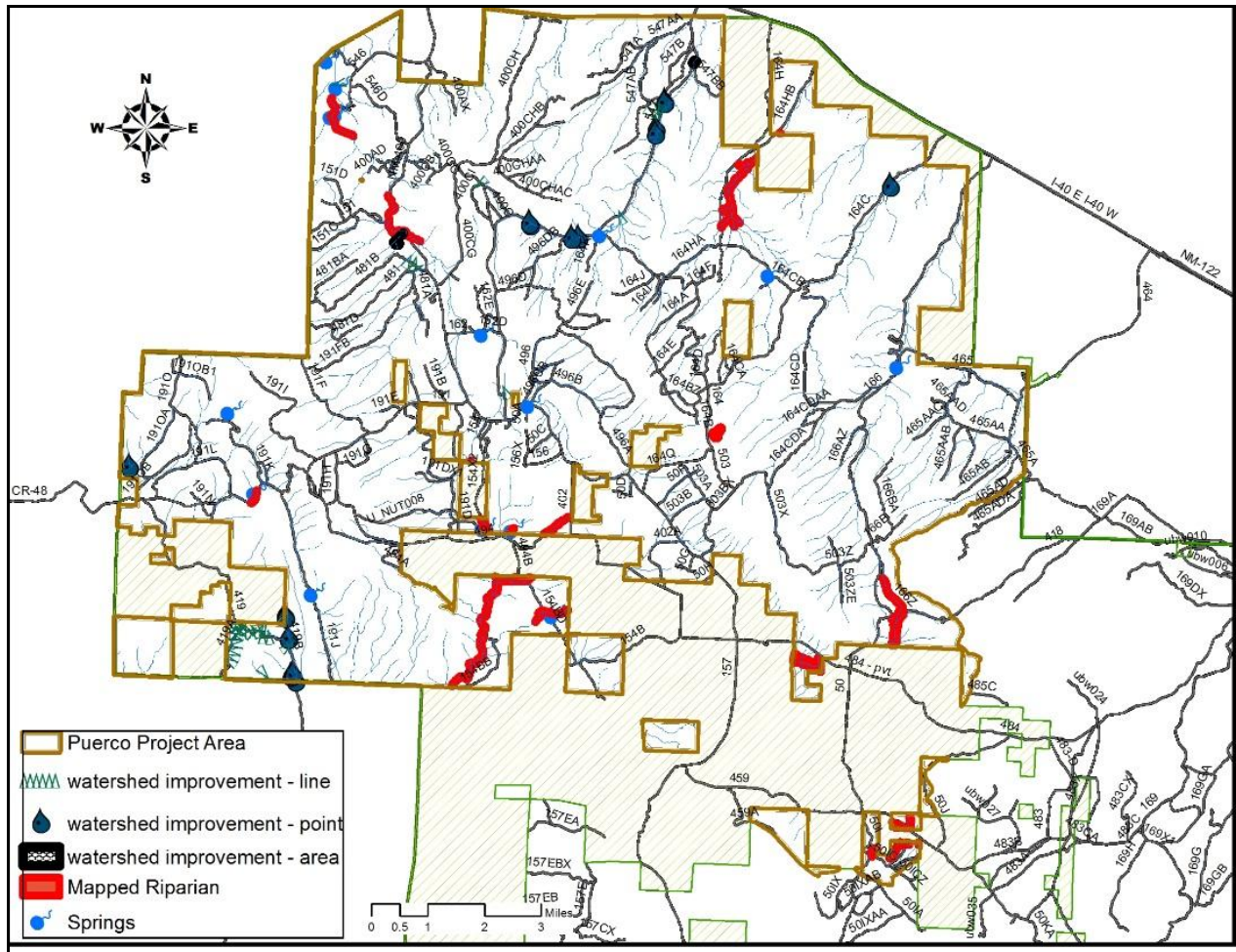
Road and Unauthorized Route Treatments

The proposal includes up to 200 miles of closing and restoring unauthorized routes within the project area. Through these actions, soil compaction and erosion would be decreased. Assuming an influence area of 21 feet, this would result in 509 acres of improved soil condition.

Watershed Improvements

Watershed improvements of various types are proposed which could result in improvements to soil condition. These include spring restoration, riparian fencing, gully treatments, and road drainage improvements. These activities would allow for soil functions to improve, including reduced compaction, increased vegetation, and less erosion. Riparian and water resource feature restoration activities would implement projects identified in Figure 3.3.2 In addition, other area within the project boundary could be restored as identified on the ground.

Figure 3.3.2. Proposed Puerco watershed improvements.



These activities include instream structures such as porous rock dams, the use of rock and wood for stabilization of headcuts and other eroding areas, plug and pond methods to direct runoff and stabilize channels and other appropriate methods. These additional activities would disturb soil in the short term across several locations and different timing. Stabilization of these soils would occur quickly as they are located in areas with sources of moisture for revegetation. Additional mitigations would be used to further ensure stabilization such as filter cloth, water bars, and other measures. Overall, watershed improvements are proposed on 250 acres of riparian area and 121 acres of eroding areas, head cuts, and other areas needing stabilization and restoration activities. As a result, 371 acres of soil would be improved.

Table 3.3.4. Summary of Measures of Project Effects for Soil Resources

Puerco Collaborative Forest Landscape Restoration Project
3. Environmental Consequences

Alternatives	Potential Acres of soil disturbance		Potential Acres of soil improvement			Transition Ratio - risk of crown fire likely if >1 ¹		Heat per Unit Area - Btu ¹	
	Motorized	Burn piles	Water resource improvements	Road rehabilitation ²	Vegetation treatments	P-J	PP	P-J	PP
Alt. A	0	0	0	0	0	6.29	1.31	562	832
Alt. B	6,949	327	371	509	62,331	.74	.05	224	280

¹ Based on high weather conditions as indicated in the Fuels report

² Based on an influence width of 21 feet (WIT 2017)

Summary of Soil Effects

Overall the effect of the proposed action on soil resources would be to improve soil function on 63,221 acres through increasing ground cover, restoring unauthorized routes, and implementing water resource improvements. Soil functions would be decreased on 7,276 acres by compaction, loss of vegetation, and erosion. These areas would experience recovery over time. In addition, monitoring would occur to identify areas where additional mitigations are needed to restore soil function. This is especially true for areas under burn piles.

Cumulative Effects

Cumulative effects generally refer to impacts that are additive or interactive (synergistic) in nature and result from multiple activities over time, including the project being assessed. The US Council on Environmental Quality defines cumulative effects as "the impacts on the environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions."

Actions occurring within the Cibola National Forest that could potentially combine with the effects of the proposed action and result in environmental impacts include vegetation treatment, thinning, prescribed fires, road management, recreation, and wildlife habitat improvements. Road maintenance has a beneficial effect on watershed and soil condition as it improves road drainage and reduces erosion and sedimentation in the long-term. Increased recreation activity is expected due to the increase in trail miles for mountain biking, horses, and hiking. New development is ongoing on private land within the project area as well.

The cumulative effect of interest for soils is soil condition. The analysis area is the project area within a ten year timeframe. This is because ten years is long enough for effects to soil from the proposed activities to become apparent. The project area was selected since this project is designed to improve landscape condition. Project activities are expected to improve soil condition on over 63,211 acres soils in the treatment area and decrease condition on 7,276 acres. This makes an important gain in this area on improving soil condition for this landscape.

The cumulative effect of interest for water resources is watershed condition as described in the WCF (USDA 2011). The cumulative effects boundaries for this project are the eleven 12 digit HUCs, sub-watersheds, listed in Table 3.4.1. Beyond this scale, any effects of the proposed action will become indistinguishable from background levels. Cumulative effects will be bound temporally 10 years in the past to 10 year in the future. The no action alternative has the most potential for changing watershed condition, due to the susceptibility for large wildfires. A large wildfire has the potential to change watershed condition to ‘poor’ on any of the 6th code watersheds in the project area. Implementing one of the action alternatives could provide control opportunities, thereby reducing the size and severity of potential wildfires. However, due to the small amount of treatment proposed and localized control opportunities that would be created, the proposed action would not reduce this risk enough to make a change in the potential for changing the overall watershed condition class.

3.4 Water Resources

Affected Environment

A systematic method of delineating watershed boundaries and giving them a number code was developed by the USGS (Seaber, Kapinos, & Knapp, 1987). The number code is called the hydrologic unit code (HUC). Each two digits refer to successively smaller watershed delineations within the previous two digits of the HUC. The analysis area is situated in eleven 12 digit watersheds, called Sub-Watersheds. Table 3.4.1 lists the 12 digit Sub-Watersheds where the analysis area is located, and percent of analysis area within each watershed.

Table 3.4.1. Sub-Watersheds within Puerco Analysis Area

HUC	Sub-Watershed	Acres of Analysis Area in Sub-Watershed	Percent	Watershed condition Rating (FS lands only)
150200040103	Cebolla Creek	8,522	24.0	Functioning at Risk
150200060102	Fourmile Canyon-South Fork Puerco River	7,344	23.1	Functioning Properly
150200060401	Headwaters Bread Springs Wash	949	4.4	Not Rated
130202070202	Headwaters Cottonwood Creek	23,081	64.7	Functioning at Risk
150200040203	Middle Rio Nutria	10,341	26.0	Functioning at Risk
150200060103	Milk Ranch Canyon	12,380	65.1	Functioning at Risk
150200060104	Milk Ranch Canyon-South Fork Puerco River	13,871	39.7	Functioning Properly
150200060501	Skeets Arroyo-Whitewater Arroyo	2,370	7.2	Functioning Properly
150200060101	Smith Canyon-South Fork Puerco River	16,272	43.1	Functioning Properly
150200040202	Stinking Spring	3,426	22.0	Functioning Properly

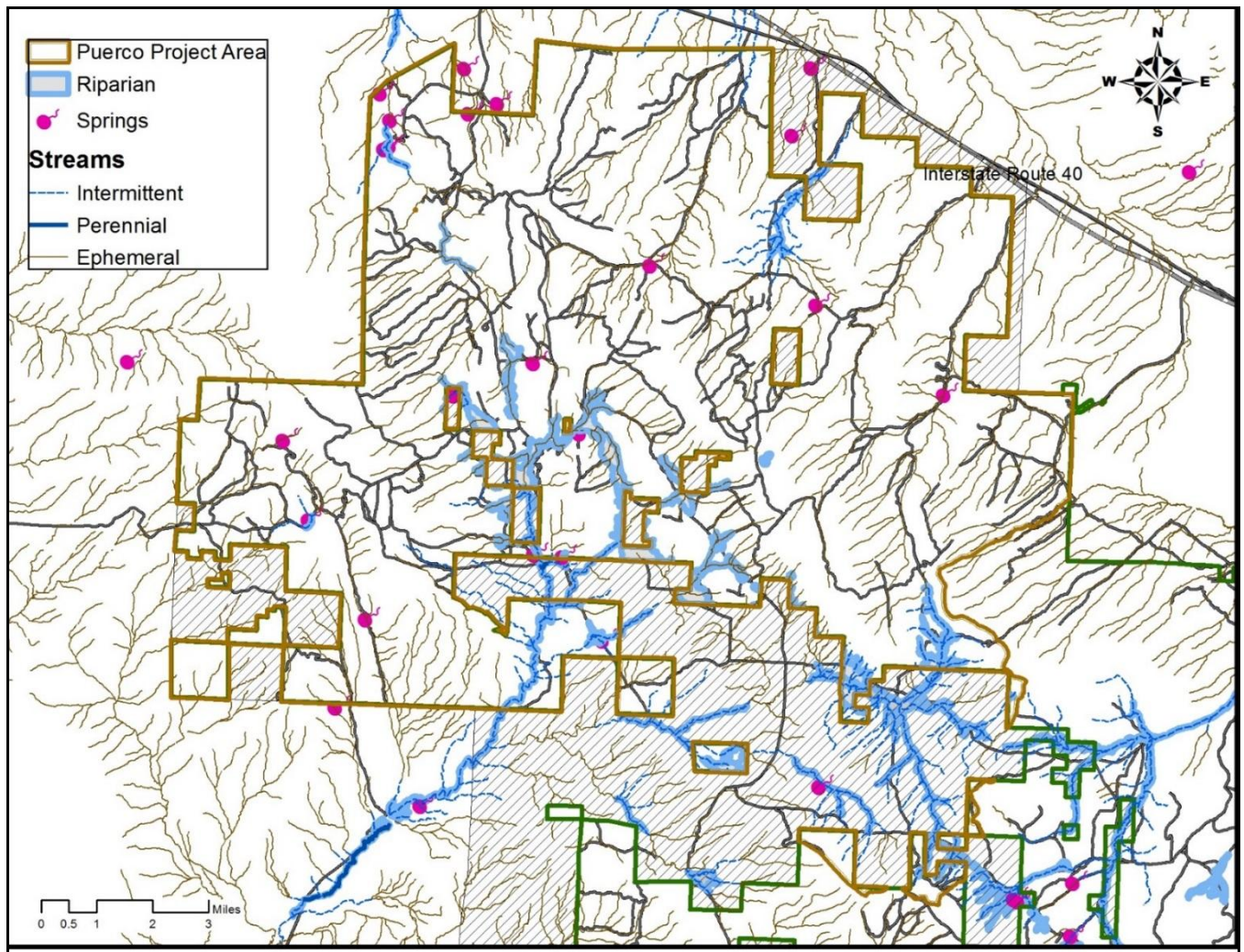
Puerco Collaborative Forest Landscape Restoration Project
3. Environmental Consequences

150200040201	Upper Rio Nutria	19,114	44.6	Functioning at Risk
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Watershed condition was assessed at the 12 digit Sub-Watershed scale using the Watershed Condition Framework process (USDA 2011). The Sub-Watershed, Headwaters Bread Springs Wash, was not rated since less than 10% of their area is located on Cibola National Forest system lands. Watershed condition is the state of a watershed based upon physical and biological characteristics affecting hydrologic and soil functions. Twelve indicators were used to assess watershed condition. Fire condition and roads and trail indicators are rated as poor for all watersheds. Aquatic habitat is rated as poor in the Upper and Middle Rio Nutria watersheds. Both of these watersheds support the Zuni Bluehead Sucker, a recently listed fish. Soil condition rated from fair to poor in all of the rated watersheds. The indicators, forest cover, forest health, terrestrial invasive species, and water quality are rated as good for the rated watersheds. These indicators help to show which components of the watersheds could use restoration.

Water resource features include the streams, springs, and riparian areas that occur within project area. Stream and spring information is from the National Hydrography Data (NHD) maintained by USGS. The riparian data is from the RMAP (Regional Riparian Mapping Project) data layer created by the Forest Service. The GIS datasets are still being verified and updated as new information becomes available. Figure 3.4.1 shows the locations of the water resource features within the project watersheds. Wetlands in project area include the small perennial portions of streams, intermittent streams, springs, and riparian areas. There are 335.3 miles of mapped ephemeral streams and 45.0 miles of mapped intermittent streams within the project area. There 259 acres of mapped riparian and 19 springs in the project area.

Figure 3.4.1. Water Resource Features within Puerco Project Watersheds



Streams

There are three types of stream based on the persistence of stream flow. Perennial stream flow year round except during periods of exceptional drought. There are currently no mapped perennial streams within the project area. There are areas of perennial waters, associated with springs and an area where an uncapped artesian well flows freely into a channel on the east side of the project area. The majority of the streams are ephemeral which means they only flow in direct response to snow melt or rainfall. Some streams are intermittent which means they flow part of the time beyond snow melt or rainfall events but not all years. Intermittent streams and perennial streams support riparian areas by storing water beyond since the presence of water supports riparian vegetation. Ephemeral and intermittent streams have important values even though they do not flow continuously (Levick et al 2007).

Springs

There are 19 springs identified for inventory within the project area, listed in Table 3.4.2. Of these springs, 17 of these have been inventoried. Four of the springs were wet when visited. Isotope data from these springs has identified snow pack as the dominant recharge source for water flowing from these springs. Many of these springs have infrastructure associated with developments. Several of the developments are no longer functional and the springs are dry. Data from inventoried springs with water has shown that snow pack is an important recharge source for springs in the Zuni Mountains. Agua Remora, the spring which supports the Zuni Bluehead Sucker is monitored continuously for water quality and water level. Projects are proposed to address improving the condition of these sites.

Table 3.4.2. Springs in the Puerco Project Area

Spring Name	Inventory	Visited
Brennan Spring	Dry	2015
Grasshopper Spring	Wet	2015
Gravel Pit Spring	Dry	2015
Little Bear Spring	Dry	2012
Milk Ranch Spring	Dry	2015
Reseed Seep	Dry	2012
Santa Fe Spring	Dry	2015
Sheep Lab Spring	Dry	2015
Shuster Spring	Dry	2015
Sixmile Spring	Wet	2012
Stinking Spring	Dry	2015
Tampico Spring	Dry	2015
Turkey Springs	Dry	2015
166N1	Dry	2012
166N2	Wet	2012
Agua Remora	Wet	2015
Rim Site (Unnamed)	Dry	2012
Unnamed Spring	Not Visited	n/a
Unnamed Spring	Not Visited	n/a

Water Quality

A review of the 2016-2018 State of New Mexico's Clean Water Act §303(d)/§305(b) Integrated Report (NMED 2016) indicates there is one 12 digit sub-watersheds in the project area with a stream listed as impaired. Agua Medio-Bluewater Creek (HUC=130202070201) is the headwater watershed of Bluewater Creek. Bluewater Creek is listed as not supporting the designated use of a coldwater fishery due to temperature. Probable sources were listed as forest roads, silviculture harvesting, loss of riparian habitat, and streambank modification/destabilization.

There is water quality data available in the area of Agua Remora, a spring where the Zuni Bluehead Sucker fish survives. This data shows that spring flows generally supports water quality of sufficient quality to support the fish, but temperatures and dissolved oxygen can vary to levels which result in at risk conditions for the fish during the summer months. One monitored pool which does not receive spring flows does not support the fish due to low oxygen levels. In addition, these pools are at risk for drying up during droughts. In addition, the dependence of these spring flows on snow packs for recharge places them at risk as snow packs diminish in the Zuni Mountains.

There is no water quality data available for the ephemeral and intermittent streams in project area.

Water quality criteria for ephemeral and intermittent waters in New Mexico are linked to the designated uses of livestock watering, wildlife habitat, aquatic life and secondary contact. Criteria for secondary contact in these waters are limited to an E.coli bacteria standard. It is unknown whether or not this standard is met in ephemeral and intermittent water in the analysis area. It is likely that on Forest Service lands, this criterion is met due to limited sources of bacteria in the watershed since there are no livestock grazing or septic systems. Recreation use in areas without sanitary facilities does have the potential to increase these levels locally and for short periods of time. However, most recreation areas in the Puerco project area have sanitary facilities and camping activities are dispersed and water flow is intermittent to ephemeral, therefore it is unlikely there is a measurable effect from these uses.

Riparian

There are 259 acres of mapped riparian areas within the Puerco project area. Most of this riparian is herbaceous in wet meadows. Soil condition in many of these meadow areas is impaired or unsatisfactory due to lack of ground cover and bare ground. No formal proper functioning condition assessments have been made in the project area.

Environmental Consequences

The analysis area is the water resource features in the project area. This includes the springs, stream channels, riparian areas, and project watersheds within the project area. Measures to assess effects to water resources were developed for each topic. The measures for water resources are listed in Table 3.4.3. A discussion of these measures is listed below.

The water resource features within the project area include stream channels, springs, and riparian areas. The effects to water resource features is assessed using the measures shown in Table 3.4.3. While prescribed mitigations as described in the BMP appendix will protect these features, the effectiveness of mitigations and project design features are not 100%. As a result, some effects are likely to occur in these areas within the analysis timeframe of 10 years. The timeframe for analysis is ten years since effects could be observable within this timeframe.

The analysis area for water quality is the surface waters within the project area. This includes the seasonal waters in the intermittent and ephemeral streams. The water quality components most likely to be affected by the proposed activities are sediment, and dissolved nutrients such as nitrogen. Ecosystems accumulate and cycle large quantities of nutrients. Fire and loss of vegetation can disrupt this cycle and cause nutrient leaching, volatilization, and transformation (Elliot et al 2010). Wildfire release more nitrogen into surface waters than prescribed fire (Stednick 2000). If vegetation is quickly reestablished, nutrient exports are short-lived and usually do not represent a threat to water quality (Elliot et al 2010). Because of this, nitrogen effects are not carried through the analysis.

Sediment is discussed in each alternative since sediment would be mobilized during proposed activities despite mitigations. Increased site disturbance will result in increased soil erosion and subsequent sediment production (Elliot et al 2010) to a stream channel or other water resource feature. Stream channels adjust to increased sediment loads. Fine sediment in channel bottoms, can cause changes to micro-invertebrates and changes in stream type. Roads and motor vehicle use are the source of much of the sediment related to harvest activities (Elliot et al 2010). Increased traffic on roads related to tree removal activities leads to increased erosion and sediment from these roads and adjacent areas.

The prescribed management zone for these features (perennial waters, springs, riparian areas) is at least 300 feet, so where implemented properly, this prescribed BMP combined with other operational BMPs as described in the appendix will protect these features. BMP monitoring across the Cibola National Forest has shown that where implemented, BMPs such as these are effective in protecting water quality and healthy stream conditions. Three hundred feet was chosen since several sources including modeling based on Forest specific parameters (WEPP) indicate that 100m (303 feet) is generally effective in controlling sediment (Belt et al 1992). Therefore, identifying those activities which are within 300 feet of riparian areas, streams, and springs is a way to identify areas which could contribute to sediment and other impacts to these features. However, because mitigation effectiveness is not 100%, the measures for sediment are acres treated with mechanized and/or motorized methods and miles of roads and/or routes proposed for decommissioning within 300 feet of water resource features.

Removing vegetation has the potential to increase water yields, change the timing of flow, and increase floods within a watershed (Elliot et al 2010). However, negligible water yield potential for piñon-juniper vegetation type has been reported (Zou, et al 2010). In the ponderosa pine vegetation type, there is the potential for some response, mostly from the redistribution of snow cover on north facing slopes (Baker, 1986). However, when precipitation is low as in the project area, water yield increases are less likely to occur, even in the ponderosa pine zone (Hibbert 1983, Bosch and Hewlett 1982, Brown et al 2005, and Zou et al 2010). Hibbert (1983) found that when precipitation is less than 18 inches and evapotranspiration exceeds precipitation, it is timber harvest is unlikely to reduce transpiration and observe measureable increases in water

yield from vegetation treatments. This effect is not carried through the analysis because changes in water quantity are not likely to be observable given the scale of treatment across 12 sub-watersheds, rate of treatment activities (3000 acres/year), and amount of basal area removed across each sub-watershed.

Alternative A – No Action

There would be no direct effects on water resources or watersheds from the No Action Alternative. This is because there would be no activities occurring that would cause ground disturbance to water resource features or loss of vegetative cover. There would be indirect effects from the no action alternative, largely due to the continued risk of uncharacteristic wildfire and related effects. Restoration work would not occur as part of this proposal, so there would be no accelerated recovery of riparian areas or stream channels in the analysis area.

Riparian and other water features proposed for improvement through the proposed activities would not be implemented as part of this decision, should a no action alternative be selected. Because of this natural processes would slowly work to improve riparian condition without the benefit of accelerated recovery as a result of proposed riparian project. The condition of water resources features would remain as described in the affected environment section. This includes the riparian areas and intermittent and ephemeral channels in the project area. As described in the Fire/Fuels report, under this alternative, existing forest conditions could lead to uncharacteristic wildfire with susceptibility to crown fire and high surface heating across large portions of the project area, as evidenced from recent wildfires in the area. Wildfire removes vegetation and causes bare soil, leading increased erosion, sedimentation, and runoff (USDA Forest Service 2010). As a result, channels adjust, water quality changes, depending on the severity and extent of the fire.

If a wildfire were to occur within the project area it could have adverse effects on the riparian areas. A wildfire affects riparian areas both directly and indirectly. The direct effects consist mainly of consumption (removal) of the vegetation that intercepts precipitation, and the partial consumption of the underlying litter layer. The indirect affect to riparian areas it decreases watershed stability, and in steep erodible topography, debris flows are likely (USDA, 2005). However, depending on the severity, recovery of vegetation can be rapid within a couple years to pre-fire conditions in some environments; it is dependent on the combined disturbance of both the fire and the flooding. Should this happen most of these effects would decrease to undetectable levels within 10 years as revegetation occurs and water resources features such as channels and spring recover.

Water quality in the project area would remain much the same, with the continued susceptibility to uncharacteristic wildfire and sediment yield related to roads and trails. Measureable changes related to wildfire would increase sediment and flow for about five - ten years, then return to background levels.

Puerco Collaborative Forest Landscape Restoration Project
3. Environmental Consequences

Change to water yields in the project watersheds as a result of the no action alternative depends on whether or not a wildfire occurs within the timeframe of analysis – 10 years. There would be no change in water yield due to the proposed vegetative treatments. However, as mentioned in the Fuels report, the susceptibility for high heat per unit area values is greatest under this no action alternative for ponderosa pine and mixed conifer vegetation types. Control opportunities for fighting wildfire would not be created under this alternative, leading to less control opportunities which could lead to extensive wildfire that burns large percentages of watersheds. Wildfire removes vegetation and causes bare soil, leading increased erosion, sedimentation, and runoff (Elliot et al 2010). Runoff from wildfire areas would also increase depending on the amount of fire within each watershed. Should this happen most of these effects would decrease to undetectable levels within 10 years as revegetation occurs.

This alternative provides the least direct impact to water resources, but has the greatest potential indirect effects due to increased risk to wildfire and reduced control opportunities.

Table 3.4.3. Measures used to Assess Effects on Water Resources by Alternative

Resource	Measures	Alternative A - No Action	Alternative B - Proposed Action Negative Effects	Alternative B - Proposed Action Positive Effects
Riparian	Acres of mapped riparian area within vegetative treatments with motorized activity	0.0	201.2	--
Riparian	Acres of riparian fenced	0.0	--	259
Streams and water quality	Miles of mapped stream channels (intermittent/ephemeral) within 300 feet of vegetative treatments proposed for treatment with motorized methods intermittent	0.0	38.5	--
Streams and water quality	ephemeral	0.0	271.5	--
Streams and water quality	Miles of stream within 300 feet of decommissioned routes intermittent	0.0	--	9.5
Streams and water quality	ephemeral	0.0	--	57.5
Springs	Number of springs with restorative work	0	--	19
Watershed condition	Acres restored water resource improvements	0.0	--	169.0

Alternative B

Vegetative Treatments

Direct effects to water resources features related to the proposed action include the removal of trees, compaction and disturbance from motorized and mechanized equipment and vehicles, prescribed fire, hand piling, and burning piles.

Within the proposed analysis area, there are 259 acres of riparian areas and 335.3 miles of ephemeral streams and 45.0 miles of intermittent.

While these features will be protected through the use of project design features and mitigation, it is expected there will be some short term impacts to these features. The impacts will be prevented and mitigated through the use of design features and Best Management Practices as described in the appendix. For example, stream channels in the project area would not be used as pathways for motorized vehicles. Trees within and adjacent to channels and riparian areas would be retained, except for selected removal determine to be beneficial. Some stream channels contain stringers of ponderosa pine as described in the vegetation report. These areas would be retained as groups of trees. Openings would not be created where stream channels are present or on concave slopes. These practices are described in appendix B, Best Management Practices, based on soil and water conservation practices described in FSH 2509.22 (USDA 1990).

Potential effects to water resource features are measured by the presence of these features in the treatment area since mitigations are not 100% effective and adaptive in nature. There is a process for assessing mitigations, also known as Best Management Practices (BMPs) which monitors the use of these practices. The implementation and effectiveness of BMPs is tracked to ensure these practices are reducing effects to water resources (USDA 2012). The use of BMPs which includes project design features and mitigations is detailed in Appendix D.

Ground disturbing activities have the potential to mobilize sediment into adjacent water resources features. Water resource features including riparian areas will have a designated management zone with widths that vary according to the type of water resource features. For riparian areas and perennial streams, this buffer is 300 foot. Within this zone, mechanized and motorized activities would not be allowed, but chainsaws may be used. By implementing this buffer, there would be little direct or indirect effects on water quality from the proposed activities. Ephemeral and intermittent waters would largely remain as described in the affected environment section. There may be some increased sedimentation during runoff events from soil disturbance within the project area. The prescribed buffers are expected to reduce the overland component of sediment. Other practices, such as water bars, restrictions on motorized use, and location of hand piles are expected to further reduce the input of sediment to these features. Concentrated surface runoff which has the potential to breach the prescribed buffers would be reduced by these practices.

It is unlikely that there will be changes in water yield could occur in the project watersheds due to the removal of vegetation and ground disturbance in project area. To check the potential for this, the percent proposed for treatment in each project watershed was calculated using an assumption of 50% for removal. As mentioned previously, when at least 20 % of the forest cover in a watershed is removed; base flows can increase in locations with favorable characteristics (Brown et al 2005). Favorable characteristics in the project area generally do not exist in the piñon-juniper vegetation type but may occur occasionally in the higher elevation vegetation types when snow can accumulate. Water yield potential has been linked to vegetation type in several research papers (Zou et al 2010, Baker 1986, and Brown et al 2005). This link is related to the precipitation within the vegetation types with very little potential in the piñon juniper types. Where there is snow accumulation, as in the ponderosa pine, there is a greater potential for water yield increases related to vegetation treatments.

Riparian, Spring, and Stream Restoration

Riparian restoration activities would implement projects within the project area to improve riparian, stream, and spring locations. These activities include gully treatments, riparian area improvement such as headcut treatments, plug and pond methods, induced meandering, removal of non-native invasive plants, removal of old non-functional structures and fencing, erosion control, riparian plantings, and other measures as identified in the field. These activities would work to stabilize soils, improve channel function, reconnect floodplains to channels, and restore riparian and spring areas. This work is expected to improve the proper functioning condition (PFC) of riparian areas in the Puerco project area.

Cumulative Effects

Cumulative effects generally refer to impacts that are additive or interactive (synergistic) in nature and result from multiple activities over time, including the project being assessed. The US Council on Environmental Quality defines cumulative effects as "the impacts on the environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions."

Actions occurring within the Cibola National Forest that could potentially combine with the effects of the proposed action and result in environmental impacts include vegetation treatment, thinning, prescribed fires, road management, recreation, and wildlife habitat improvements. Road maintenance has a beneficial effect on watershed and soil condition as it improves road drainage and reduces erosion and sedimentation in the long-term. Increased recreation activity is expected due to the increase in trail miles for mountain biking, horses, and hiking. New development is ongoing on private land within the project area as well.

The cumulative effect of interest for soils is soil condition. The analysis area is the project area within a ten year timeframe. This is because ten years is long enough for effects to soil from the

proposed activities to become apparent. The project area was selected since this project is designed to improve landscape condition. Project activities are expected to improve soil condition on over 63,211 acres soils in the treatment area and decrease condition on 7,276 acres. This makes an important gain in this area on improving soil condition for this landscape.

The cumulative effect of interest for water resources is watershed condition as described in the WCF (USDA 2011). The cumulative effects boundaries for this project are the six 12 digit HUCs, sub-watersheds, listed in Table 3.4.1. Beyond this scale, any effects of the proposed action will become indistinguishable from background levels. Cumulative effects will be bound temporally 10 years in the past to 10 year in the future. The no action alternative has the most potential for changing watershed condition, due to the susceptibility for large wildfires. A large wildfire has the potential to change watershed condition to ‘poor’ on any of the 6th code watersheds in the project area. Implementing one of the action alternatives could provide control opportunities, thereby reducing the size and severity of potential wildfires. However, due to the small amount of treatment proposed and localized control opportunities that would be created, the proposed action would not reduce this risk enough to make a change in the potential for changing the overall watershed condition class.

3.5 Wildlife

The affected environment and environmental consequences each contain these four sections:

1. Threatened and Endangered Species
2. Sensitive Wildlife Species
3. Management Indicator Species
4. High Priority Migratory Birds

Affected Environment

Terrestrial Wildlife, Fish and Rare Plant

The following Threatened, Endangered, and Sensitive species (TES), as displayed in table (3.5.1), have the potential to occur within the analysis area of the Puerco Landscape Restoration project on the Mt. Taylor Ranger District of the Cibola National Forest and National Grasslands (CIF).

Listed Species were identified using the U.S. Fish and Wildlife Service’s (FWS) Information, Planning and Consultation (IPAC) System. Species identified as Sensitive are listed on the U.S. Forest Service, Southwestern Region’s Regional Forester’s Sensitive Species list. (USDA 2013). A list of other species considered but not evaluated further due to lack of habitat – within the analysis area is displayed in Table (3.5.2). Table (3.5.3) is the Critical Habitat area within the project area.

Puerco Collaborative Forest Landscape Restoration Project
3. Environmental Consequences

Table 3.5.1. Potential TES Species in the Puerco Project Area

Common Name	Scientific Name	Status
Mexican spotted owl	<i>Strix occidentalis lucida</i>	Threatened
Zuni Flea bane	<i>Erigeron rhizomatus</i>	Threatened
Zuni bluehead sucker	<i>Catostomus discobolus yarrow</i>	Endangered
Southwestern willow flycatcher	<i>Empidonax trailii extimus</i>	Endangered
Mexican wolf	<i>Canis lupus baileyi</i>	Non-essential population, candidate
Spotted Bat*	<i>Euderma maculatum</i>	Sensitive
Gunnion's prairie dog	<i>Cynomys gunnisoni</i>	Sensitive
Pale Townsend's big-eared bat	<i>Corynorhinus townsendii (pallascens)</i>	Sensitive
Northern goshawk	<i>Accipiter gentilis</i>	Sensitive
Northern leopard frog	<i>Rana pipiens</i>	Sensitive
Villous groundcover milkvetch	<i>Astragalus humistratus var. crispulus</i>	Sensitive
Sivinski's fleabane	<i>Erigeron sivinskii</i>	Sensitive
Zuni milkvetch	<i>Astragalus accumbens</i>	Sensitive
Arizona leatherflower Clustered leatherflower	<i>Clematis hirsutissima var. hirsutissima</i>	Sensitive
Chaco milkvetch	<i>Astragalus micromerius</i>	Sensitive

Table 3.5.2. Species Considered but Not Evaluated

Common Name	Scientific Name	Status
Pecos sunflower	<i>Helianthus paradoxus</i>	Threatened – Does not occur within the project area.
Cebolleta southern pocket gopher	<i>Thomomys bottae paguatae</i>	Sensitive – Does not occur within the project area.
Western yellow-billed cuckoo	<i>Coccyzus americanus occidentalis</i>	Proposed – Does not occur within the project area.
American peregrine falcon	<i>Falco peregrinus (anatum)</i>	Sensitive – No suitable habitat within the project area
Rio Grande chub	<i>Gila pandora</i>	Sensitive – No suitable habitat within the project area. Not know to occur within the project boundary.
Rio Grande sucker	<i>Catostomus plebeius</i>	Sensitive – No suitable habitat within the project area. No known to occur within project boundary.
Bald eagle	<i>Haliaetus leucocephalus</i>	Sensitive – No suitable nesting habitat within the project area.
Dumont's Fairy shrimp	<i>Streptocephalus henridumontis</i>	Sensitive

Table 3.5.3. Critical Habitat

Species	<i>Critical Habitat Present</i>
Mexican spotted owl	Yes
Zuni Bluehead Sucker	Yes

Affected Habitat

Mexican Spotted Owl

Life History

The MSO typically nests in Douglas fir (*Pseudotsuga manziesii*), but in the northern part of its range in Utah and Colorado, most nests are on rock ledges or in caves in steep canyons. Most breeding MSOs inhabit mixed conifer forests in the Southern Rocky Mountains. The habitat is typically a complex forest structure in rocky canyons that contains uneven-aged mature to old growth forest stands with high canopy closure (Ganey & Blada 1989). Movement patterns are highly variable, with some individuals remaining in the same home range year-round, while others may move a great distance to lower elevation sites for the winter. Dispersing juveniles can occur in a wide variety of habitats, including mixed conifer forests, piñon-juniper woods, and riparian areas surrounded by grasslands.

The MSO may start courtship in March and lay eggs in March or April. The incubation period lasts about 30 days, with the female doing all the incubating and the male hunting for both birds and small mammals. Eggs usually hatch in May; the young fledge 4 - 5 weeks later and disperse from the nest site in September or October.

Small mammals such as woodrats (*Neotoma* sp.), mice (*Peromyscus* sp.), and voles (*Microtus* sp.) constitute the MSO's major food items. On occasion, they will take other prey such as bats, birds, and reptiles (USFWS 2001).

Habitat Requirements

Forest stands used by spotted owls for nesting and roosting have certain structural features in common. These typically include relatively high tree basal area, large trees, multi-storied canopy, multi-aged trees, high canopy cover, and decadence in the form of downed logs and snags (Ganey & Dick 1995). Many stands also contain a prominent hardwood component. This is generally provided by Gambel oak in ponderosa pine-Gambel oak forests, by a variety of evergreen oaks and madrone in Madrean pine-oak forests, and by various species in mixed conifer and montane riparian forests. The minimum conditions for owl nesting/roosting habitat are shown in Table 3.5.4. Other structures such as canopy cover, snags, and downed logs are important as well. Patterns of owl distribution and habitat use vary by Ecological Management Unit (EMU). The Puerco project occurs within the Colorado Plateau EMU pine-oak habitats.

Puerco Collaborative Forest Landscape Restoration Project
3. Environmental Consequences

EMU(s) Forest Type	% of area ¹	% BA by size class		Minimum tree BA ²	Minimum density of large trees ³
		30-46 cm DBH (12-18 in)	>46 cm DBH (>18 in)		
BRE Mixed Conifer	20	>30	>30	33.3 (145)	37 (15)
CP, UGM, SRM, BRW Mixed conifer	25	>30	>30	27.5 (120)	30 (12)
CP ⁴ , UGM, BRW Pine-oak	10	>30	>30	25.3 (110)	30 (12)

Table 3.5.4. Minimum desired conditions for mixed-conifer and pine-oak forest areas managed for Recovery nesting/roosting habitat. ¹ % of area pertains to the percent of the planning area, subregion, and/or region in the specified forest type that should be managed for threshold conditions. ² BAs in m²/ha (ft²/acre), and include all trees >1 inch DBH (i.e., any species). ³ Trees >46 cm (18 in) DBH. Density is tree/ha (trees/acres). ⁴ Pine-oak recommendations only apply to the Mount Taylor and/or Zuni Mountains regions within the CP EMU.

General management recommendations for MSO habitat focus on three categories relative to land management: Protected Activity Centers (PACs), Recovery Habitat, and Other Forest and Woodland Types.

PACs/Core Areas

PACs are established around owl nest sites and are intended to sustain and enhance areas that are presently, recently, or historically occupied by breeding MSOs. A ~100-acre core area within the PAC surrounding the nest site is designated and intended to define the parts of the PAC that should receive maximum protection by limiting the activities that have a high likelihood of disturbing owls or causing abandonment.

Recovery Habitat

Recovery Habitat occurs in forest types and in rocky canyons used by owls for roosting, foraging, dispersal, and other life history needs, but outside of PACs. It is intended to: 1) provide protection for areas that may be used by owls, 2) foster creation of roost/nest habitat, 3) simultaneously provide managers with greater management flexibility than is allowed in PACs, and 4) facilitate development and testing of management strategies that could be applied in PACs.

Other forest and woodland types

Areas not classified as either PACs or Recovery Habitats are classified as “Other Forest and Woodland Types” and “Other Riparian Forest Types.” These generally include forest, woodland, or other habitat types that appear to be little used by nesting owls but are likely used for foraging or dispersal. Given their relatively limited importance to nesting owls, no specific management is suggested for these habitat types, recognizing that the current emphasis for sustainable and resilient forests should be compatible with the needs of the owl.

Critical Habitat

The USFWS has designated Critical Habitat for the MSO. The owl inhabits canyon and forest habitats across a range that extends from southern Utah and Colorado, through Arizona, New Mexico, and west Texas, to the mountains of central Mexico. They designated approximately 3.5 million hectares (8.6 million acres) of critical habitat in Arizona, New Mexico, Colorado, and Utah on Federal lands.

Primary **constituent elements** are the physical and biological features that are essential to conservation of the species and that may require special management considerations or protection. For Mexican spotted owls, these include those physical and biological features that support nesting, roosting, and foraging. They are listed below (USFWS 2004).

1. Forest Structure:

- A range of tree species, including mixed conifer, pine-oak, and riparian forest types, composed of different tree sizes reflecting different ages of trees, 30-45% of which are large trees with a trunk diameter of greater than or equal to 0.3 m (12 in) when measured at 1.4 m (4.5 ft) from the ground;
- A shaded canopy created by the tree branches and foliage covering greater than or equal to 40% of the ground; and
- Large dead trees (i.e., snags) with a trunk diameter of at least 0.3 m (12 in) when measured at 1.4 m (4.5 ft) from the ground.

2. Maintenance of Adequate Prey Species:

- High volumes of fallen trees and other woody debris;
- A wide range of tree and plant species, including hardwoods; and
- Adequate levels of residual plant cover to maintain fruits and seeds and allow plant regeneration.

3. Canyon Habitat (one or more of the following):

- Presence of water (often providing cooler and often more humid conditions than the surrounding areas);
- Clumps or stringers of mixed-conifer, pine-oak, piñon-juniper, and/or riparian vegetation;
- Canyon walls containing crevices, ledges, or caves; and
- High percentage of ground litter and woody debris.

Regional & Local Distribution

Regional. The MSO inhabits the Coniferous Mixed Woodland in isolated mountain ranges and canyonlands in the southwestern U.S. It has the largest range of the three subspecies, extending north from Mexico through the mountains of Arizona, New Mexico, and west Texas into the canyons of Utah and western Colorado. This owl's range is fragmented, occupying isolated mountains and canyonlands. It is believed that the MSO's historic and current ranges are similar. An estimated 91 percent of the MSOs in the U.S. occur on USFS land, but a reliable estimate of the number of owls within the entire range is not available. The recovery plan identifies 11 recovery units, six of which occur in the U.S. The spotted owl habitat on land within the project area is in the Colorado Plateau Recovery Unit (RU) (USFWS 2012).

In general MSO habitat consists of dense multistory stands of mixed conifer with a component of large trees, often old remnant trees in younger stands or mature or over-mature stands. Spotted owls also prefer shaded, cool, moist canyon sites and mountain slopes with rock outcrops, cliffs, talus, and standing dead and down woody material. Forests used for roosting and nesting often contain mature or old-growth stands with complex structure. Forests used by spotted owls are typically uneven-aged, are multistoried, and have high canopy cover. In these areas, nest trees are typically large (average diameter of nest trees is 24 inches), although owls roost in both large and small trees (USDI 1995). The Mexican Spotted Owl Recovery Plan has three levels of protection codified. These categories were added to the CIF Land and Resource Management Plan (LRMP) as a Plan Amendment in 1996.

Local. The project area contains ~17,680 acres of Critical Habitat, along with 7 PACs which consist of ~ 5,865 acres within the project boundary. There are two PACs within the Critical Habitat boundary.

Surveys have been conducted on the Mt. Taylor Ranger District for the MSO beginning in the early 1990's. There are 7 PACs designated within the project boundary: 6-Mile (1,185 acres), Foster (954), Milk Ranch (1,006), Agua Remora (736), Hogback (664), Brennan Spring (624), and Smith Canyon (696). PAC monitoring has occurred in the project area annually during the breeding seasons from 2005 to 2014 (no surveys were conducted in 2011, 2015 and 2016), according to FWS protocol. In 2013 and 2014, surveys in the Foster PAC elicited responses and a breeding pair of owls with fledglings were subsequently located. In 2017, surveys were conducted within the project area outside of existing PACs, but within suitable owl nesting/foraging habitat. The 2017 surveys discovered two new locations with owl pairs present during the nesting season. As a result, two new PACs have been proposed - Brennan Spring PAC and Smith Canyon PAC. Approximately 5,865 acres of the project area is occupied with MSOs. The amount and distribution of PACs, Critical Habitat, Recovery Habitat, and Recovery Habitat-Nest/Roost is shown in Table 3.5.5.

MSO Habitat Type	Acres
Protected Activity Centers (PACs)	5,865
Critical Habitat	17,680
Recovery Habitat	28,835
Recovery Habitat – Nest/Roost	180

Table 3.5.5. Acres of MSO habitat types within the project boundary.

Threats

Since the time of listing, the primary threats have been and continue to be: 1) alteration of the habitat from timber harvesting, especially the use of even-aged silviculture, and 2) the danger of catastrophic wildfires. The frequency of fires in the coniferous forests in the southwestern U.S. was greatly reduced since 1900, resulting in a large increase in fuel loads and mid-canopy trees that can result in stand-replacing wildfires (Swetnam and Baisan 1996, Sackett and Haase 1996). One major factor contributing to the build-up of fuel loads has been the national policy to suppress all fires. It is also believed that livestock grazing has contributed to the reduction in

natural fires and build-up of fuel loads due to the depletion of grass cover necessary to carry surface fires (Covington and Moore 1992).

Zuni Fleabane

The Zuni fleabane flowers from May to June. Reproduction occurs through the formation of rhizomes or by seed production and dispersal. Due to the species' rhizomatous reproduction, it forms clumps of plants that are all clones. This makes determination of individuals difficult during surveys. Establishment of new plants by seed is rare, although a large volume of seed is produced (Fletcher 1978; Sabo 1981).

Habitat Requirements

All populations of Zuni fleabane occur in very similar habitats on coarse-textured shale outcrops of the Chinle and Baca formations (Knight 1988, Christie 2004). Early field surveys noted the seleniferous nature of occupied outcrops in the Zuni and Datil/Sawtooth Mountains by the presence of associated seleniphytic plant species and the strong odor of selenium in some habitats (Fletcher 1978; Sabo 1982; Sivinski & Lightfoot 1991). Christie (2004), however, gives no indication that selenium is an obvious substrate characteristic for Zuni fleabane in the Chuska Mountains. It, therefore, may not be an obligate seleniphyte as previously thought.

Geologic substrate for Zuni fleabane in the Zuni Mountains is Chinle Shale. Plants occur on gray and brown strata that consist of sandy shale or shale that decomposes into very small indurate pieces, which impart a sandy texture to the surface soil. The plants occur on gentle and steep slopes with all exposures at elevations from 7,300 ft to 7,380 ft. Dominant associated vegetation consists of *Pinus edulis*, *Juniperus monosperma*, *Cercocarpus montanus*, *Quercus gambelii*, *Fraxinus cuspidata*, *Ericameria nauseosa*, *Yucca baileyi*, *Gutierrezia sarothrae*, *Achnatherum hymenoides*, and *Pleuraphis jamesii*. No plants that are primary indicator species of selenium-laden soils are present.

*No critical habitat rules have been published for the Zuni fleabane.

Regional & Local Distribution

This plant is known from 3 locations in the Zuni Mountains near Fort Wingate, 28 locations (probably more) in the Sawtooth and northwest Datil mountains, and at least 3 locations in the Chuska Mountains on the Navajo Nation. The distribution of *Erigeron rhizomatus* is associated with the distribution of uranium deposits in west-central New Mexico. Many of the sites for this plant occur at historical or current mining claims that were considered uneconomical at present uranium prices in 2006 (McDonald 2006).

Zuni fleabane habitat is located on the north slope of the Zuni Mountains near Fort Wingate in southwestern McKinley County. Distributions and numbers of individuals were assessed at the two known sites – one in Six-Mile Canyon (Six-Mile locality) and the other in a canyon south of Ft. Wingate (Type locality). A new potential Zuni Mountains location was obtained from exact coordinates and location description on a herbarium specimen label from the San Juan College in Farmington, NM (K.D. Heil et al. 29450 SJNM). A visit to this new Zuni Mountains location did not locate any Zuni fleabane plants and the habitat did not appear suitable for this plant species.

Site Name	Location	1994 Size	2014 Size	2014 Health
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Puerco Collaborative Forest Landscape Restoration Project
3. Environmental Consequences

Type	Zuni Mtns	1000	231	Fair
Six-Mile	Zuni Mtns	300	75	Fair
Total		1300	306	

Table 3.5.6. Zuni fleabane Zuni meta-population estimates for 2 sites on the Cibola National Forest.

There are only two locations currently known in the Zuni Mountains, and both are relatively small. The Type locality (where originally discovered) had only 231 Zuni fleabane plants in 2014. Their condition was fair considering the extremely dry conditions that caused many to not flower nor fill out with new stems or root sprouts. The small patch of plants in Six-Mile Canyon had 75 individuals and was also in fair condition.

These two locations of known plant occurrences are 3.9 miles apart, and they may constitute separate populations. Wind dispersal of seeds and pollen transfer by generalist pollinators could potentially occur over this distance so that locations in the Zuni Mountains are more likely parts of a meta-population with occasional gene flow between patches of plants.

The two known areas of occurrence also occur within the Puerco project boundary. They are on the north end of the project area on the Chinle formation, which comprises approximately 8,000 acres within the project boundary (Figure 16). One of the known populations within the project area is enclosed with a barbwire fence to protect the plants from grazing activities. The fenced area is ~3 acres in size.

Original estimates of the population numbers for the Zuni meta-population showed a marked decline in the number of plants since 1994, when the Type locality was estimated to contain 1000 plants, and the Six-Mile population was estimated to contain 300 plants (Sivinski 1994). In 2014, only 231 and 75 plants were found at the two sites, respectively. Overall, the Type locality site had fewer individual plants scattered throughout the habitat and were mainly concentrated in just four clusters of plants. The small population in Six-Mile Canyon has always been small, but seemed to occupy less area in 2014 than previous years, especially on the east side of the habitat patch (Roth & Sivinski 2014).

Threats

The main threats to the Zuni fleabane are from habitat disturbance, especially if there is ever a resumption of uranium mining. Most of the populations in the Datil and Sawtooth mountains occur within or very close to extensive, currently inactive, uranium claims and could be destroyed or severely damaged if the claims are ever reactivated and developed without planning for the species' protection. Road construction and resulting erosion could also have adverse impacts on the species (Fletcher 1978; Sabo 1981).

Several individuals of Zuni fleabane in the Zuni Mountains are growing within 50 ft of NM State Route 400 pavement. There were no indications of recent highway right-of-way maintenance or herbicide spraying. However, any future maintenance that might impact the cut slopes on the east side of the highway or the application of herbicides within 50 ft of the pavement can potentially harm or eliminate approximately 20% of the Type locality plants. The fence around the Six-Mile patch was still functional in 2014, excluding livestock and OHVs. No new land use threats were identified for the meta-population during the 2014 survey. No invasive exotic species were documented at the Six-Mile site during the 2014 surveys. However, the Type locality contained

several invasive exotic plant species and trash on both sides of NM State Route 400, including significant numbers of bindweed (*Convolvulus arvensis*) and sweet clover (*Melilotus officinalis*).

Numerous dead and drought-stressed Zuni fleabane plants were found in the Zuni populations during the 2014 survey, and it is reasonable to assume that the Zuni fleabane population decline is the result of recent climatic stress, specifically drought. Drought and climate change were not listed as a threat to the species in the past. The species has survived much longer droughts in recent millennia (data from Stahle et al. 2000). Current and future droughts, however, will be coincident with higher temperatures (Woodhouse et al. 2010), which may be more lethal to Zuni fleabane. This rare plant has remarkable tolerance to drought, but a climate changing towards drier conditions with higher temperatures and more persistent droughts could become the most serious threat to the survival of the species (Roth & Sivinski 2014).

Zuni Bluehead Sucker

Zuni bluehead suckers have physical adaptations that reflect their benthic feeding habits. The jaws are ventrally placed and the lower mandible is modified with a cartilaginous ridge for scraping the substrate to obtain attached algae. Stomach analysis has revealed that Zuni bluehead sucker diet is primarily composed of fine particulate organic material, filamentous algae, midge (Insecta: Chironomidae) larvae and flatworms (Platyhelminthes), with occasional ingestion of other aquatic invertebrates, fish scales, and eggs (Smith and Koehn 1979). Zuni bluehead sucker spawning was reported from early April to early June when water temperatures were 6 to 15°C, peaking around 10°C (Propst 1999, Propst et al. 2001). Propst et al. (2001) found evidence that spawning may be bimodal with most spawning occurring early in the season. Females typically produce 200 to 300 ova with larger females producing more eggs. It has been suggested that Zuni bluehead suckers move very little during their life cycle. Larvae may move a short distance downstream and adults may stay in or near one pool throughout adult life, only moving several meters upstream to spawn. This is similar to activity patterns reported for other *Catostomus* species (Emery 1973, Pearson and Healey 2003).

Habitat Requirements

Hanson (1980) described Zuni bluehead sucker habitat as largely shaded, pool and riffle habitats with coarse substrates. Propst and Hobbes (1996) found Zuni bluehead sucker primarily in shaded pools and pool-runs, about 0.3 to 0.5-m deep with water velocity less than 10 cm/s. Zuni bluehead suckers were found over clean, hard substrate, from gravel and cobble to boulders and bedrock. In general, it was rare or absent in reaches where the substrate was dominated by silt or sand. Emergent aquatic plants often edged pool and pool-run habitats. Perilithic and periphytic algae were seasonally present in habitats where suckers were common. Collections in 2000 and 2001 also found Zuni bluehead sucker in these same general habitats, with the majority taken from shady, cobble and bedrock pool-run stretches of a stream (Carman et al. 2003).

Although habitat needs for specific life stages of Zuni bluehead sucker have not been described, this information is available for bluehead sucker. Bluehead sucker juveniles tend to be found in shallow, slower areas along shorelines, moving out into the deeper, faster channel with age (Childs et al. 1998). Preferred spawning habitat for bluehead suckers is clean gravel beds (Maddux and Kepner 1988).

Critical Habitat

The USFWS has designated Critical Habitat for the Zuni bluehead sucker (2016). They designated the Zuni River Unit, which includes the Zuni River Headwaters (Aqua Remora, Rio Nutria, Tampico Draw, and Tampico Spring) and the Zuni River Mainstem (Cebolla Creek). In total, 34.6 miles of critical habitat have been designated, all of which are in New Mexico. Approximately 12 miles of Critical Habitat (~35% of the total) occur on FS land within the Cibola NF, and 9.7 miles occur within the Puerco project boundary.

Primary **constituent elements** are the physical and biological features that are essential to conservation of the species and that may require special management considerations or protection. For the Zuni bluehead sucker, these include those physical and biological features that support breeding and foraging. They are listed below (USFWS 2004).

The primary **constituent elements** of critical habitat are contained within the riverine ecosystem formed by the wetted channel and the adjacent floodplains within 91.4 lateral m (300 lateral ft) on either side of bankfull stage, except where bounded by canyon walls. They include:

- (1) A riverine system with habitat to support all life stages of Zuni bluehead sucker (egg, larval, juvenile, and adult), which includes:
 - a. Dynamic flows that allow for periodic changes in channel morphology and adequate river functions, such as channel reshaping and delivery of coarse sediments.
 - b. Stream courses with perennial flows, or areas that may be periodically dewatered but serve as connective corridors between occupied or seasonally occupied habitat and through which the species may move when the habitat is wetted;
 - c. Stream microhabitat types including runs, riffles, and pools with substrate ranging from gravel, cobble, and bedrock substrates with low or moderate amounts of fine sediment and substrate embeddedness;
 - d. Streams with depths generally less than 2 m (3.3 ft), and with slow to swift flow velocities less than 35 cm/sec (1.1 ft/sec);
 - e. Clear, cool water with low turbidity and temperatures in the general range of 9.0 to 28.0 °C (48.2 to 82.4 °F).
 - f. No harmful levels of pollutants; and
 - g. Adequate riparian shading to reduce water temperatures when ambient temperatures are high and provide protective cover from predators.
- (2) An abundant aquatic insect food base consisting of fine particulate organic material, filamentous algae, midge larvae, caddisfly larvae, mayfly larvae, flatworms, and small terrestrial insects.
- (3) Areas devoid of nonnative aquatic species or areas that are maintained to keep nonnative species at a level that allows the Zuni bluehead sucker to continue to survive and reproduce. Developed areas such as lands covered by bridges, docks, aqueducts, and other structures are excluded because such lands lack physical or biological features for the Zuni bluehead sucker. These areas are excluded by text in the proposed rule (78 FR 5357).

Regional & Local Distribution

Regional. The Zuni bluehead sucker rangewide distribution has been reduced by over 90 percent in the last 20 years (Propst 1999). The Zuni bluehead sucker is now found in low numbers in the

Kinlichee Creek and Canyon de Chelly areas in Arizona and is restricted to three isolated populations in the upper Río Nutria drainage in west-central New Mexico.

The Zuni bluehead sucker occurred historically in at least the Zuni River system upstream of the Arizona-New Mexico border. More recent surveys determined the distribution of the species in New Mexico to be limited mainly to the Río Nutria drainage upstream of the mouth of the Nutria Box Canyon (Propst et al. 2001). This included the mouth of Río Nutria box canyon, upper Río Nutria, confluence of Tampico Draw and Río Nutria, Tampico Spring, and Agua Remora. Historical records exist of *Catostomus discobolus yarrowi* in Kinlichee Creek, Apache County, Arizona, but the occurrence of the subspecies outside the Zuni River Watershed is currently disputed.

Local. Within the project area, a single location, Agua Remora, is occupied by Zuni bluehead suckers (Figure 19). Less than half a mile of Critical Habitat within the FS lands has individual Zuni bluehead suckers present. The other occupied reaches are on private land. Portions of some of the occupied reaches have intermittent flows, containing water only seasonally or in wet years (NMDGF 2013 and 2004).

Threats

Zuni bluehead sucker numbers have been starkly reduced in the Zuni River watershed in New Mexico, largely due to 27 chemical treatments during the 1960s to remove green sunfish (*Lepomis cyanellus*) and fathead minnow (*Pimephales promelas*) from the Río Nutria to aid in the establishment of a rainbow trout (*Oncorhynchus mykiss*) sport fishery in reservoirs on Zuni Pueblo (Winter 1979).

The principal threats to Zuni bluehead sucker habitat include water withdrawal, sedimentation, impoundments, housing development, wildfire, and climate change. These threats are intensified by the species' small range. Severe degradation to watersheds occupied by Zuni bluehead sucker has occurred through excessive timber harvest, overgrazing, and road construction. Although most of these activities occurred in the late 1800s and early 1900s, the subsequent erosion, gullyng, headcutting, and loss of water have continued to degrade habitat for the Zuni bluehead sucker (NMDGF 2004).

This sucker inhabits a variety of lotic habitats, featuring laminar to slightly turbulent flows. In general, the available habitat is limited, most of it in New Mexico being in headwater areas above various diversions and impoundments. The streams presently occupied in that area are 1.2-3.0 m wide and typically very shallow, except for a few pools that may be 0.6-0.9 m deep. Portions of some of the occupied streams are temporary, containing water only seasonally or in wet years. There is a population present within the project boundary, and it is fed by the Agua Remora spring. A pipe fence surrounds the spring and pools spanning less than 1 mile where the species is known to occur. A second population lies ~1 mile to the north on private land.

Watershed condition may be considered a threat to the continued existence of this species. According to the Watershed Condition Classification document, and the Assessment report of Ecological/Social/Economic Conditions, Trends and Risks to Sustainability, Cibola National Forest Mountain Ranger Districts, the watershed condition within HUC 6 have been characterized as follows:

Table 3.5.7. Watershed Condition Class for Zuni Bluehead Sucker Habitat

Watershed Name	Watershed Condition Rate	Perennial streams abundance	Groundwater/Springs abundance
Upper Rio Nutria 150200040201	Fair	None	Representative-high
Middle Rio Nutria 150200040203	Fair	None	Representative-low
Cebolla Creek 150200040103	Fair	None	None

All three of the watersheds are rated fair for watershed condition, which means they are functioning at risk. The watershed supports medium to small blocks of contiguous habitat. Some high-quality aquatic habitat is available, but stream channel conditions show signs of being degraded. (USDA July 2011. Watershed Condition Classification technical guide.)

Southwestern Willow Flycatcher

In general the southwestern willow flycatcher prefers moist, shrubby areas, often with standing or running water. In the southwest they occur in riparian forests with or without shrubs (Sedgwick 2000). In the desert southwest, only southwestern willow flycatchers breed along wooded desert streams (Sedgwick 2000). Currently, just under a mile of willow habitat exists along Bluewater creek from Andrew's Cabin to FR 178. This stretch of riparian habitat is protected with cattle exposures and road closures (Schwarz, 2008).

Surveys have been conducted by the Cibola National Forest in the Bluewater Creek territory since 1993 based on a single southwestern willow flycatcher detected there in the mid 1990's. No southwestern willow flycatchers have been found since 1994 (Schwarz, 2008), and none have been found within the project boundary.

Mexican Wolf

Life History

The gray wolf breeds in late fall/early winter in the south, and in February/March in the north. Gestation lasts about 2 months, and young are born in March and early April in the south (Hoffmeister 1986). Litter size is 4 – 10 with one litter per year. Only the dominant male/ female mate and rear offspring. Some offspring remain with the pack, and others disperse as they mature. Breeding first occurs in the second or third year (Hoffmeister 1986). They are territorial throughout the year in most areas and do not migrate. Packs consist of one or more family groups (2-8 member, but up to 21) with a dominance hierarchy.

Generally, wolves are not instrumental in causing prey declines, but effects vary with other circumstances. Their predominant prey includes ungulates. When these are low or seasonably unavailable, they will consume alternate prey such as beaver, snowshoe hare, rodents and carrion. They commonly hunt in packs, but lone wolves and pairs are capable of killing prey as large as adult moose (Thurber and Peterson 1993). They may take livestock as secondary prey when deer fawns (primary summer prey source) are less vulnerable due to better prenatal nutrition resulting from mild winters (USFWS 1990). Home ranges are very large but variable as

well, generally ranging from less than 100 to 10,000 square kilometers. They have no particular habitat preference.

Habitat Requirements

Gray wolves have no particular habitat preference, but require large areas of contiguous habitat that can include forests and mountainous terrain. Mexican gray wolves can thrive in desert and brush in the southwest. Suitable habitat must have sufficient access to prey, protection from excessive persecution, and areas for denning and taking shelter.

*No critical habitat rules have been published for the Mexican wolf.

Regional & Local Distribution

Regional. Gray wolves historically occurred throughout North America south through much of Mexico. Today, they are found south of Canada only in northern Mexico, a few areas in the Rocky Mountains, northwestern Great Lakes region, and Cascade Mountains of northern Washington. They were formerly much more numerous in the Rocky Mountain states than in the southwestern U.S. (Johnson 1991). They have been extirpated in much of southern Canada, but remain in 85% of the former total Canadian range (Theberge 1991).

Reintroduction of the Mexican wolf into the Blue Range Wolf Recovery Area (BRWRA) of Arizona and New Mexico was initiated in March 1998. Mexican wolves released into the BRWRA and their offspring are designated as a nonessential experimental population, which allows for greater management flexibility to address wolf conflict situations such as livestock depredations and nuisance behavior. The BRWRA is a defined geographic area that encompasses areas in NM and AZ south of I-40, and is divided into Wolf Management Zones 1 through 3 (Figure 23).

The end of year census for 2018 was a minimum of 131 Mexican wolves in the wild (64 in AZ and 67 in NM). This was an approximate 12% increase in the population from a minimum of 117 wolves counted at the end of 2017. At the end of March 2019, there were 27 packs (13 in AZ and 14 in NM) (Mexican Wolf Interagency Field Team 2019).

Local. The Cibola National Forest has not surveyed for this species. The U.S. Fish and Wildlife Service regularly conducts surveys and monitoring for the species. Individual radio collared wolves have occasionally been located traveling through the Zuni Mountains in the past. However, no known packs have been established within the Puerco project area. A portion of the Zuni Mountains along approximately the eastern half of the range is shown as occupied Mexican wolf range on U.S. Fish and Wildlife Service's online mapping tool (<https://fws.maps.arcgis.com/apps/webappviewer/index.html?id=e87092240501466abd4606dcdb50ce98>).

Threats

Historically, hundreds of thousands of gray wolves occurred in the wild throughout North America. During the 19th and 20th centuries, as the human population grew, and consequently the urban-wildland interface, people began to compete with wolves for game and habitat. Wolves were commonly viewed as pests and vermin, and were slaughtered by the thousands. As a result, wolves were nearly eradicated from the lower 48 states. Where wolves are protected under the **Endangered Species Act** (ESA), the most common cause of death for wolves is conflict with

people. According to the Mexican wolf Blue Range Project statistics from 2014, illegal mortality was most common cause of mortality of Mexican wolves, and accounted for 55% of all observed mortalities (USFWS 2014). Illegal mortality includes, but is not limited to, illegal shooting with a firearm, illegal shooting with an arrow, and public trap-related mortality. Mis-identification in coyote hunting has also been suspected as a significant threat to Mexican wolves (Newsome et al. 2015). Additionally, while wolf predation on livestock is fairly uncommon, wolves that are suspected of preying on livestock are often killed, sometimes even entire packs.

Another serious threat is human encroachment into wolf [habitat](#). This leads to habitat fragmentation, where wolves might have to travel across lands with varying degrees of protection, across highways, through developed areas and across large portions of private land, potentially containing livestock. In 2014, vehicle collision was identified as the second highest killer of Mexican wolves (USFWS 2014). All of these increase the risks wolves face. This makes it very difficult for wolves to adequately expand into all areas of suitable habitat, which is vital to sustainable recovery of wolves in the lower 48.

Sensitive Species

The Forest Service has developed policy requirements for the designation of sensitive plant and animal species (Forest Service Manual (FSM) 2670; Supplement 2600-94-2). The Regional Forester's Sensitive Species List contains taxa only when they meet one or more of the following three criteria: 1), the species is declining in numbers or occurrences and evidence indicates it could be proposed for federal listing as threatened or endangered if action is not taken to reverse or stop the downward trend, 2) the species habitat is declining and continued loss could result in population declines that lead to federal listing as threatened or endangered if action is not taken to reverse or stop the decline, and 3), the species' population or habitat is stable but limited.

Spotted Bat

The spotted bat ranges from Mexico through the western states to the southern border of British Columbia. It is found in various habitats from desert to montane coniferous stands, including open ponderosa pine, pinyon-juniper woodland, canyon bottoms, open pasture, and hayfields. Speculation has been made that captures outside coniferous forests reflect post-breeding wandering (NatureServe 2008). Many bats in New Mexico were caught over waterholes near a sandstone cliff with numerous vertical cracks (NatureServe 2008). There is approximately 51,660 acres habitat within the project area. It is unknown the exact acres of habitat occupied due to lack of survey data. Due to the lack of information, it is assumed the entire 51,660 acres is occupied.

Many bats in New Mexico were caught over waterholes near a sandstone cliff with numerous vertical cracks (NatureServe 2008). The spotted bat is a relatively specialized feeder, subsisting almost entirely on moths. It catches all its prey in the air, in contrast to some bats which glean insects from vegetation or the ground. Some moth species can hear the high-frequency

echolocation calls of many bats, and take evasive action to avoid being captured. The spotted bat however, has calls of lower frequency which are outside the hearing range of most moths, allowing it to successfully capitalize on this widespread source of food (Blood 1993).

Gunnison's prairie dog

Gunnison's prairie dogs are usually found in areas with grassland/herbaceous and shrubland areas. High mountain valleys and plateaus at elevations of 1,830 – 3,660 meters, as well as open or slightly brushy country, sometimes with scattered junipers and pines is the preferred habitat type. There are approximately 3,359 acres of habitat within the project area. It is unknown the exact acres of habitat occupied due to lack of survey data. Due to the lack of information, it is assumed the entire 3,359 acres is occupied.

They can be found mostly in areas with high abundance of native plants. They occupy burrows usually on slopes or in hummocks. Gunnison's prairie dogs are herbivorous (www.natureserve.org).

Pale Townsend's big-eared bat

The pale Townsend's big-eared bat is a western species occurring in semi-desert shrublands, piñon-juniper woodlands, and open montane forests, including spruce-fir. There is approximately 52,243 acres of habitat within the project area. . It is unknown the exact acres of habitat occupied due to lack of survey data. Due to the lack of information, it is assumed the entire 52,243 acres is occupied. It is associated with caves and abandoned mines for day roosts and hibernacula, but will also use abandoned buildings and crevices on rock cliffs for refuge. Maternity sites include trees, caves or man-made structures. Births occur from May to mid-June. By the last half of July, most young of the year are able to fly. Night roosts include caves, open buildings, rock shelters, and cement culverts beneath roads, bridges and mines. They are relatively sedentary. They do not move long distances from hibernacula to summer roosts nor do they forage far from their day roosts. Their diets consist of greater than 90% moths. Threats include habitat loss, cave vandalism and disturbance by cave explorers at maternity and hibernation roosts. (BISON-M 2006).

Individuals or small groups (3-5 individuals) of bats may day roost in hollow and creviced trees and snags for a limited time. The most significant roosts are those with large congregations of bats, summer maternity roosts, and winter hibernacula. These sites are highly sensitive to disturbance and human interference. Foraging occurs after dark in a variety of habitats including, open areas as well as forested areas. The bat forages within tree canopies and gleans insects from vegetation. This bat can forage up to 8 miles from day roosts, but tends to forage within a few miles of colonial roosts. These bats hibernate in caves and abandoned mines. They are extremely sensitive to disturbance at their roosting sites and have suffered severe population declines throughout much of the U.S.

Northern Goshawk

Throughout the southwestern U.S. nests are primarily found in ponderosa pine forest. Other forest types used by goshawks include Douglas fir, various pines, and aspen. There is approximately 41,592 acres of suitable habitat within the project area. Surveys have taken place on and off for the last several years, but the most recent surveys have been in 2013, 2014, 2017 and 2018. There are four PFAs within the project area, which consists of approximately 2,400 acres goshawks have been known to occupy. Three alternate PFAs have also been established in stands where habitat is suitable, but no birds have been found within these areas. Forest stands containing nests are often small, approximately 10-100 hectares. Territories may contain 1-5 alternate nest areas. Although goshawks prefer certain nest habitat structures, habitat characteristics in nest areas vary from territory to territory, depending on availability.

Nests are typically in mature to old-growth forests composed primarily of large trees, with (60%-90%) canopy closure, near the bottom of moderate hill slopes, with sparse ground cover. Closed stands may reduce predation and, along with north slopes, provide relatively cool environments. Nest habitat is single to multistoried, depending on forest type. Water is usually found near the nesting area, consisting of anything from a forest pond or ephemeral stream to a major river or large lake, but these water sources are not a habitat requirement.

Goshawks hunt in diverse habitats ranging from open-sage to dense forests, including riparian areas. Foraging individuals travel through the forest in a series of short flights, punctuated with brief periods of prey searching from elevated hunting perches. Goshawk behavior and morphology are adapted for hunting in moderately dense mature forests where prey species are most vulnerable. In some habitats, nest site preference increased with increasing canopy closure and some populations forage in open habitats.

Northern leopard frog

This leopard frog ranges in a wide variety of habitats (springs, marshes, wet meadows, riparian areas, vegetated irrigation canals, ponds, and reservoirs) but require a high degree of vegetative cover for concealment (NatureServe Explore 2006, BISON-M 2006). There are 259 acres of riparian habitat and 19 springs within the project area. It is unknown the exact acres of habitat occupied due to lack of survey data. Due to the lack of information, it is assumed the entire 259 acres is occupied. In New Mexico they are known from about 3,600-10,000 feet and breed in ponds or lake edges with fairly, dense aquatic emergent vegetation from April-July and September–October (Degenhardt et al 1996). They attach their eggs to submerged vegetation well below the surface, in water 0.5 meter deep or more (NatureServe Explore 2006). Over-wintering habitats are larger lakes and streams that do not freeze completely during winter (NatureServe Explore 2006). The leopard frog feed on various insects and spiders (Degenhardt et al 1996).

American peregrine falcon

Suitable habitat for the peregrine falcon includes; various open habitats from grassland to forested areas in association with suitable nesting cliffs (NatureServe Explorer 2008). The falcon often nests on ledges or holes on the face of rocky cliffs or crags. Ideal locations include undisturbed areas with a wide view, near water, and close to plentiful prey. There are no known areas of occupied habitat for peregrine falcon within the project area. There are two known sites that are outside of the project area, and these areas are over 20 miles away. There are no known peregrine sites within the project area. Foraging habitats of woodlands, open grasslands, and bodies of water are generally associated with the nesting territory. Falcons are known to forage over large areas, often ten to fifteen miles from the eyrie. Probably the greatest threat to Peregrines breeding in New Mexico is human disturbance. Falcons in this state typically occupy fairly remote locations for breeding, and are not sensitized to human activity. Even fairly low levels of human disturbance may sometimes cause nest and territory abandonment (White et al. 2002).

Villous groundcover milkvetch

This plant prefers sandy soils of volcanic origin on slopes, benches, and ledges in xeric pine forest; from 7,250-8,150 feet in elevation. (NMRPTC 1999). There are approximately 40,750 acres of ponderosa and ponderosa pine oak habitat, but it is unknown the number of habitat occupied. Due to the lack of information, it is assumed the entire 40,750 acres is occupied.

Sivinski's fleabane

This species is found in chinle shale in pinon-juniper woodland and Great Basin desert scrub; from 6,100-7,400 feet in elevation. (NMRPTC 1999). There are approximately 25,701 acres of pinon juniper habitat, but it is unknown the number of habitat occupied. Due to the lack of information, it is assumed the entire 25,701 acres is occupied.

Zuni milkvetch

Found in gravelly clay banks and knolls, in dry, alkaline soils derived from sandstone, in piñon-juniper woodlands; 1,890-2,410 m (6,200-7,900 ft). In the Zuni Mountains, this plant is associated with *Erigeron rhizomatus*, another endemic plant. (NMRPTC 1999). There are approximately 25,701 acres of pinon juniper habitat, but it is unknown the number of habitat occupied. Due to the lack of information, it is assumed the entire 25,701 acres is occupied.

Arizona leatherflower Clustered leatherflower

It flowers in spring and summer. Moist mountain meadows, prairies, and open woods and thickets; 700-3300 m; Ariz., Colo., Idaho, Mont., N.Mex., Oreg., Utah, Wash., Wyo. (NMRPTC 1999). There are approximately 7407 acres of grasslands/shrublands, but it is unknown the number of habitat occupied. Due to the lack of information, it is assumed the entire 7,407 acres is occupied.

Chaco milkvetch

Found on gypseous or limy sandstones in piñon-juniper woodland or Great Basin desert scrub; 2,000-2,250 m (6,600-7,300 ft.). This diminutive endemic is usually associated with outcrops of sandstone that are blended with Todilto gypsum or limestone. It has a fairly wide range, but is sporadically distributed in isolated populations (NMRPTC 1999). There are approximately 25,701 acres of pinon juniper habitat, but it is unknown the number of habitat occupied. Due to the lack of information, it is assumed the entire 25,701 acres is occupied.

Management Indicator Species

The Forest Service is charged with managing all renewable resources, including wildlife, on National Forest lands. This obligation was enacted by Congress and set forth in the National Forest Management Act (NFMA) of 1976. As a federal law, the NFMA is the primary statute governing the administration of National Forests. The Forest Service first promulgated regulations implementing NFMA in September, 1979, and subsequently revised them in 1982 (known as the 1982 Rule). The 1976 legislation requires the Secretary of Agriculture to assess forest lands, and develop and implement a land and resource management plan for each unit of the National Forest System. These management plans, commonly known as forest plans, guide management activities on each National Forest. Therefore, site-specific projects proposed on national forests must comply with the applicable forest plan or the plan must be amended.

The 1982 regulations require forest plans to manage fish and wildlife habitat so viable populations of existing native and desired nonnative vertebrate species are maintained in the planning area (i.e., each individual National Forest). Under the 1982 regulations, a viable population is regarded as one that has the estimated numbers and distribution of reproductive individuals to insure its continued existence, is well distributed in the planning area, and that habitat must be well distributed so that those individuals can interact with others in the planning area.

Puerco Collaborative Forest Landscape Restoration Project
3. Environmental Consequences

Because it is impossible to address the thousands of species that occur on National Forests, the use of Management Indicator Species (MIS) serves as a barometer for more than the selected species and a surrogate for addressing other species' ecological needs. As directed by NFMA and the 1982 Rule, each forest plan identifies and selects certain vertebrate, invertebrate, or plant species present in each National Forest as MIS because their population changes are believed to indicate the effects of management activities (36 CFR 219.19(a)(1)).

Additionally, the 1982 regulations require that population trends of the management indicator species will be monitored and relationships to habitat changes determined (36 CFR 219.19(a)(6)). Forest Service Manual (FSM) 2621.1 defines management indicators as plant and animal species, communities or special habitats, selected for emphasis in planning, and which are monitored during forest plan implementation in order to assess the effects of management activities on their populations and the populations of other species with similar habitat needs which they may represent (FSM 2620.5). Therefore, important characteristics of MIS are that they have narrow habitat associations, representing ecosystem components important to multiple species, and are capable of being effectively monitored.

Under the 1982 Rule, Forest Service officials have broad discretion to select MIS. The deciding official, using information provided by an interdisciplinary planning team, determines whether the population changes of certain species are believed to indicate the effects of management activities. The 1982 Rule specifies that species are to be selected from various categories where appropriate, indicating there is no requirement that all categories of species or habitats be represented. For additional information see the 2014 Forest-wide MIS Report to be located in the project record and which is incorporated by reference.

Table 3.5.8. Summary of Forest Service MIS evaluated for the Puerco Restoration EA.

Common Name	Habitat Indicator or Listing Rationale	Habitat Description	Habitat Present in Project Area?	Analysis in Impacts Section?	Acres of habitat within project area & percentage of change Forest wide.
Elk	Mtn. Grassland/mixed conifer	Elk require some element of escape and protection. Elk use dense cover for seclusion away from disturbance, and as thermal protection. Elk consume a combination of grasses, forbs, and shrubs.	Yes	Yes	7,976 2.1%
Mule deer	Pinyon-juniper	Mule Deer occur in coniferous forests, desert shrubs, chaparral, grasslands with shrubs, and are often associated with early successional vegetation.	Yes	Yes	25,701 3.6%
House wren	Riparian	In western foothills and mountains, found in deciduous or mixed deciduous-coniferous woodlands in canyons and riparian areas, in open ponderosa pine	Yes	Yes	259

Puerco Collaborative Forest Landscape Restoration Project
3. Environmental Consequences

Common Name	Habitat Indicator or Listing Rationale	Habitat Description	Habitat Present in Project Area?	Analysis in Impacts Section?	Acres of habitat within project area & percentage of change Forest wide.
		and Douglas fir parklands, in piñon-juniper, oak, and walnut woodlands, up to 3,000m in aspen groves and at edges or in clear-cut or thinned areas of denser montane coniferous forests.			3.4%
Juniper titmouse	Pinyon-juniper	Prefers warm, dry habitats of open woodland. Most common where juniper is dominant and where large, mature trees are present to provide natural cavities for nesting. In the Southwest, piñon-juniper woodland may be mixed with deciduous or evergreen oaks.	Yes	Yes	25,701 3.6%
Red-breasted nuthatch	Spruce-fir	Typically mature and diverse stands of coniferous forest, especially where spruce, fir, pine, hemlock, larch, and cedar are present, and less frequently in pure stand of pine and hemlock. May also breed in mixed woodland when strong coniferous component is associated with deciduous trees such as aspen, oak and poplar.	No	No	None 0%
Black bear	Mixed conifer	Black bears require some element of escape and protection. Black bears use dense cover for seclusion away from disturbance, and as thermal protection.	Yes	Yes	569 3.4%
Pygmy nuthatch	Ponderosa pine	Shows a strong and almost exclusive preference for long-needled pine forests. Range almost co-extensive with that of ponderosa pine, Jeffrey pine, and similar species.	Yes	Yes	25,959 3.6%
Hairy woodpecker	Mixed conifer	Primarily a forest bird; widely distributed in regions where mature woodlands prevalent. Also occurs in small woodlots, wooded parks, cemeteries, shaded residential areas, and other urban areas with mature shade trees, but often scarce within these habitats. In the southwest some preference for open pine forest.	Yes	Yes	569 0.3%
Red-naped sapsucker	Deciduous forest(includes mountain shrub)	Breeds in deciduous and mixed woodlands including aspen groves in open ponderosa pine forests, aspen-fir parklands, logged forests where deciduous groves remain, aspen groves in open rangeland, birch groves, montane coniferous forest and occasionally, subalpine forest edges and residential gardens.	Yes	Yes	3,359 4.6%
Merriam's wild turkey	Ponderosa pine	Not regularly found below the piñon-juniper zone and seldom occur where this	Yes	Yes	

Puerco Collaborative Forest Landscape Restoration Project
3. Environmental Consequences

Common Name	Habitat Indicator or Listing Rationale	Habitat Description	Habitat Present in Project Area?	Analysis in Impacts Section?	Acres of habitat within project area & percentage of change Forest wide.
		does not adjoin a higher area with ponderosa pine for nesting and brood range. Historic Merriam range includes both piñon-juniper and chaparral brush.			25,959 3.6%
Long billed curlew	Plains grassland	Nests primarily in short grass or mixed prairie habitat with flat to rolling topography. Habitats with trees, high density shrubs and tall, dense grass generally avoided.	No	No	None 0%
Grasshopper sparrow	Plains grassland	Prefers moderately open grasslands and prairies with patchy bare ground; they select different components of vegetation, depending on grassland ecosystem. Occupies lush areas with shrub cover in arid grasslands of the Southwest and West but selects sparser vegetation in East and Midwest, e.g., tallgrass and short grass prairie.	No	No	None 0%
Rio Grande turkey	Eastern riparian	Occupies semiarid areas. Mostly found in mesquite grasslands. Principal tree species, usually in more mesic sites, are live oak, pecan, American elm, cedar elm, sugar hackberry, net leaf hackberry and cottonwood.	No	No	None 0%

Table 3.5.9. Ten MIS for the Cibola NF Mountain Districts their Habitat Type Associations, and Current Trends

Species	Habitat Type	Habitat Trend	Population Trend
1. Elk (<i>Cervus canadensis</i>)	Mountain grassland Mixed conifer	Stable Stable	Upward
2. Mule Deer (<i>Odocoileus hemionus</i>)	Mountain shrub Piñon-juniper	Downward Stable	Downward
3. Black bear (<i>Ursus americanus</i>)	Spruce-fir Mixed conifer	Stable Stable	Stable
4. Merriam's Turkey (<i>Meleagris gallopavo merriami</i>)	Ponderosa pine	Stable	Upward
5. Red-naped Sapsucker (<i>Sphyrapicus nuchalis</i>)	Deciduous Forest	Stable	*Upward → Stable
6. House Wren (<i>Troglodytes aedon</i>)	Riparian	*Upward → Downward	*Stable → Downward

Puerco Collaborative Forest Landscape Restoration Project
3. Environmental Consequences

7. Juniper Titmouse (previously Plain titmouse) (<i>Baeolophus ridgwayi</i>)	Piñon-juniper	Stable	Downward
8. Pygmy nuthatch (<i>Sitta pygmaea</i>)	Ponderosa pine	Stable	*Stable→Upward
9. Hairy woodpecker (<i>Picoides villosus</i>)	Mixed conifer	Stable	*Upward →Stable

*indicates a change in trend from the last analysis conducted in 2014

Vegetation

The Cibola LRMP EIS (page 142) displays percentages of the 1,611,306 acres, which make up the vegetation types for the Cibola NF. The MIS analysis completed in 2014 displayed vegetation by Ecotype without the benefit of Terrestrial Ecosystem Unit Inventory (TEUI) data. More recent information using TEUI as well as Mid-Scale Vegetation Dominance Type mapping shows some similarities and some differences depending on vegetation type. In 2014 the CIBOLA NF produced the Ecological/Social/Economic Conditions, Trends, and Risks to Sustainability report which provides an Assessment of Current Status and Projected Trend for Vegetation Structure. Information from the vegetation assessment report was used to update this MIS report.

Table 3.5.10. Percentage of acres by Vegetation type

HABITAT TYPE	1985 Cibola LRMP	2002 MIS Report	2005 % and TEU Data	2014 acres and % with TEU, RMAP and Midscale Data
Piñon-juniper	33%	39%	39%	702,112 ac. 44%
Ponderosa pine	23%	26%	26%	454,780 ac. 28%
Mixed conifer	4%	4%	10%	187,488 ac. 12%
Mountain grassland	<1%	<1%	9%	179,444 ac. 11%
Mountain Shrub	7%	>7%	3%	69,731 ac. 4%
Riparian	<1%	<1%	<1%	7,569 ac. <1%
Deciduous forest	1%	1%	<1%	2,416 ac. 0.15%

Increases in both ponderosa pine and piñon- juniper acres can be attributed to encroachment into areas previously typed as mountain shrub and mountain grassland due to fire suppression and drought related drying of wet meadow systems; soils normally too saturated for conifer survival. Some change during the last 15 years can also be attributed to better mapping technology including the use of GIS and the Terrestrial Ecosystem Unit Inventory method. The change in the

amount of habitat classified as riparian is attributed to the Regional Riparian Mapping Project (RMAP) that better maps

Rocky Mountain Elk

In the Cibola Forest Land and Resource Management Plan (ALRMP) elk were selected as Management Indicator Species for the mountain grasslands and mixed conifer habitat found on the Forest. The justification for this selection reads as follows; “Elk – grazer, fairly adaptable, not representative over entire Forest, however, a good indicator of meadow types in those areas where it does appear. Easily monitored and identified. Is a species of high public interest and can be managed for.” (Process Criteria for Selection of MIS of Wildlife, Cibola NF, Black Kettle NG, Kiowa NG, Rita Blanca NG, Winter, F.A. 1981).

In the Cibola LRMP EIS, page 142, mountain grasslands were determined to cover approximately 1 percent of the total area on the Forest. Mountain grasslands are now estimated to cover 179,444 acres (11%). The most recent analysis indicates the quantity of mountain grassland acres has changed due primarily to the way grasslands are classified and some shifting upon the landscape. This habitat type is well represented and distributed across all four mountain Districts of the Cibola National Forest and the habitat trend is currently considered stable.

At the time of the Cibola LRMP analysis, mixed conifer habitat covered approximately 4 percent of the total area on the Cibola NF (Cibola ALRMP EIS, pg. 142). The most recent estimates indicate an increase in this acreage so that now about 12 percent of the Forest is considered to be mixed conifer habitat attributed to better mapping technology including the use of GIS and the Terrestrial Ecosystem Unit Survey method. Management of this habitat type will maintain a stable habitat trend. Mixed conifer is currently estimated to cover 187,488 acres on the Cibola NF.

Mule Deer

In the Cibola National Forest Land and Resource Management Plan (LRMP) mule deer were selected as Management Indicator Species for the mountain shrub and piñon-juniper habitat found on the Forest. The justification for this selection reads as follows; “Mule Deer – browser, adaptable, easily identified and can be monitored by known methods. Is a species of high public interest and can be managed for.” (Process Criteria for Selection of MIS of Wildlife, Cibola NF, Black Kettle NG, Kiowa NG, Rita Blanca NG, Winter, F.A. 1981).

Piñon – juniper habitat covered 33 percent of the Cibola NF in 1985 and now PJ occurs on an estimated 702,112 acres representing about 44 percent of the total. Even though the amount is higher in 2014, the habitat trend for piñon-juniper habitat is stable because of the improved mapping and classification technologies. Both piñon-juniper and mountain shrub habitat types are well represented and distributed across all four mountain Districts of the CIBOLA NF.

Juniper titmouse

In July 1985, piñon-juniper was estimated to cover 33 percent of the Cibola NF. This habitat type is well represented and distributed across all four mountain Districts of the Cibola NF. This habitat type is now estimated to cover 702,112 acres (44 percent). Piñon-juniper habitat is considered stable on the Forest and the availability of large snags is considered adequate with low to moderate departure from reference conditions.

The juniper titmouse appears to be declining on the Cibola NF, judging by recent counts that are generally lower than average. The overall negative trend for NM, suggests a future downward trend on the Cibola National Forest.

Black Bear

In 1985, mixed conifer habitat covered approximately four percent of the Cibola NF (LRMP EIS, p. 142). The most recent estimates indicate that mixed conifer represents 12% of the acreage on the Forest due to improved mapping techniques, rather than an increase in the habitat type. This habitat type is well represented and distributed across all four mountain Districts. The mixed conifer habitat remains stable.

Habitat in general and spruce fir and mixed-conifer in specific, have not proven to be a limiting factor for population expansion. This leads to speculation that the assumptions made during the 1990s, although certainly valid from a public interest point of view, which led to the selection of black bear as an MIS for spruce fir and mixed-conifer conditions may not have been correct. Population levels instead appear to be determined by hunting pressure, and availability of mast as a result of weather patterns. Black bear populations appear to be stable on the Cibola National Forest.

Pygmy nuthatch

In 1985 ponderosa pine was estimated to cover 23 percent of the Forest. Recent calculations estimates there are 702,112 acres of ponderosa pine on the Cibola NF. Ponderosa pine habitat is considered to be stable on the Forest.

Pygmy Nuthatches are seen on the Cibola NF transects in expected numbers. The long term outlook is positive for Pygmy Nuthatch because considerable restoration is planned for ponderosa pine habitat, i.e. it is being thinned and burned allowing for the growth of fewer but larger healthier trees less susceptible to wildfire, insects and disease infestations. The availability of large snags in ponderosa pine habitat is considered adequate with low departure from reference conditions. The population trend for pygmy nuthatch is considered stable on the Cibola NF.

Hairy woodpecker

In 1985 mixed conifer was estimated to cover four percent of the Forest (LRMP EIS, p. 142). Now mixed conifer represents about 12%, 187,488 acres, of the forest due to the way mixed conifer is mapped using advanced techniques. This habitat type is well represented and distributed across all four mountain Districts of the Cibola NF. Habitat trend for mixed conifer is considered stable.

For a species with low detectability like the hairy woodpecker the Cibola NF surveys are probably more accurate in assessing the local populations since the duration of the count period is longer. The hairy woodpecker is the most widespread MIS bird and one of the most abundant on the Cibola NF. Numbers however are indicating a change from an upward population trend on the Forest to a stable trend. The availability of large snags is considered adequate for this species with low departure from reference conditions.

Merriam's Turkey

In 1985 ponderosa pine was estimated to cover 23 percent of the Cibola NF. Ponderosa pine now covers an estimated 454,780 acres representing about 28 percent of the total Forest acres according to current mapping indicating a stable trend for ponderosa pine habitat. Turkey roost trees and associated stands are generally protected from harvest, although some have certainly been lost to wild fires.

Most mountain ranges in New Mexico support healthy self-sustaining Merriam's turkey populations. Harvest surveys and brood surveys have been conducted to index population trends. Harvest surveys are still performed; however, brood surveys have not been conducted since 1988. The general statewide turkey population trend between the 1920's and the late 1950's was steadily upward based upon hen to poult ratio collected annually. According to the EIS for the LRMP, the total turkey population for the Forest was estimated at 2,780 birds in 1985 (p. 91). The present statewide population is likely around 31,500 Merriam's turkeys.

Since numbers are subject to fluctuation dictated by annual weather cycles, numbers within the state may tend to vary between 27,000 and 36,000. However, population numbers are expected to increase in the future indicating an upward population trend on the Cibola National Forest (NMDGF Long Range Plan for the Management of Wild Turkey in New Mexico 2001-2005).

Red-naped Sapsucker

At the time the CIF LRMP was signed (July 1985), deciduous forest was estimated to cover about 1 percent of the Forest. This habitat type is well represented and distributed across all four mountain Districts of the CIF, with larger stands of aspen on the Mt. Taylor Ranger District. Currently this habitat type covers only about 2,733 acres of the Forest. The habitat trend in the deciduous forest remains stable.

Ten of the 32 BBS on the CIF have detected red-naped sapsuckers. The sites on the CIF having these sapsuckers continue to attract them year after year. Routes on the CIF exhibit a stable trend. The fact that these sapsuckers are local does make them vulnerable to habitat loss especially regarding the trend for the mixed conifer with aspen habitat type which is showing a 13% downward trend compared to reference condition for aspen/mixed deciduous (all sizes - open and closed).

House Wren

The CIF LRMP EIS (1985) estimated riparian habitat occurred on less than 1 percent of the Forest and Grasslands. Current mapping of this habitat type indicates there are 7,565 acres on the CIF. This habitat type is well represented and distributed across all four mountain Districts of the CIF. Although the quality of the riparian habitats has improved somewhat with the implementation of livestock and vehicle exclosures around riparian habitat, and the implementation of the Travel Management Rule which resulted in an overall reduction in the miles of motorized roads and trails in riparian habitat, riparian areas on the Cibola are expected to continue to degrade due to legacy management reasons. The effects of herbivory are being managed through wildlife and livestock management plans with levels well below what existed before the establishment of the Cibola National Forest. These lower levels have allowed some of the riparian areas to recover from past effects, where possible. Where projects have been developed to conserve or protect remaining riparian areas or to rehabilitate and restore missing riparian areas, local conditions might be expected to improve, and these areas can move closer to proper functioning condition. However, external factors such as climate change and continued drought can be assumed to continue to exert stress on these areas.

Based on this information, the habitat trend of riparian habitat is expected to decline and is in a downward trend. Although the house wren is the designated indicator for riparian areas, this designation applies primarily at lower elevation from about 7,500 feet (sometimes even lower) to about 8,500 feet. Above that, riparian structure with willow and cottonwood trees is no longer necessary.

The overall downward trend for New Mexico is deemed fairly reliable by USGS. The USGS surveys on the CIF however do not have a sufficiently long history to be reliable. CIF surveys that regularly pick up house wrens indicate a downward population.

Migratory Birds

Band Tailed pigeon

This species may be found from pinyon-juniper up through spruce/fir depending on availability of food that includes a wide variety of mast such as fruits and nuts, especially acorns and pinyon pine nuts. In August and September it often descends into the foothills to for shrub live-oak and gray oak acorns. In the Southwest, Band-tailed Pigeons inhabit montane forests dominated by pines and oaks, sometimes extending upward in elevation to timberline. Multi-layer forests with

tall trees and an understory are most favored. In New Mexico, the species is most common in southern ponderosa pine and pine-oak communities (Keppie and Braun 2000).

Black Throated gray warbler

This species can be found in p-j with some oak understory between 7000 to 8000 feet, but can also be common in more mesic p-j with a high canopy closure. Black-throated Gray Warbler is generally associated with middle-elevation coniferous or mixed coniferous/deciduous woodland with brushy undergrowth, sometimes ranging into montane shrub associations or open forests with a mix of pines and deciduous trees (Guzy and Lowther 1997, Parmeter et al. 2002). This species tends to prefer large woodland stands, but it often uses edge habitat (Sedgwick 1987). During migration, it may occur statewide in wooded areas at lower and middle elevations (Hubbard 1978).

Piñon Jay

Suitable habitat within the Forest for the piñon jay includes piñon-juniper woodlands and sagebrush dominated sites. The piñon jay's nest consists of a bowl of piñon, juniper or oak twigs. This bird is a colony nester. Pinyon Jays are predominantly associated with pinyon-juniper habitat, due to the species' tightly co-evolved relationship with pinyon pines. In New Mexico, Pinyon Jays are associated primarily with Colorado pinyon (*Pinus edulis*). These trees rely on the jay for dispersal of their wingless seeds, and the jay has a suite of morphological and behavioral adaptations to efficiently exploit the rich food resource that pinyon seeds provide. Pinyon seed production is sporadic, and mobile flocks require large stands of mature trees spread over a wide area (Balda 2002, Yanishevsky and Petring-Rupp 1998). Despite its close association with the pinyon pine, the Pinyon Jay is an omnivore and sometimes occurs in areas dominated by ponderosa pine, sagebrush, or chaparral vegetation (Balda 2002).

Virginia's Warbler

The Virginia's warbler prefers generally arid montane woodlands ranging in elevation from 6,000 to 9,000 feet. Preferred habitats consist of brushy slopes, oak dominated canyons, scrub brush interspersed with piñon-juniper woodland and ponderosa pine forest. This is especially true for the Forest when an oak understory is present. The Virginia's warbler frequents dense growths of mountain mahogany (*Cercocarpus montanus*) and choke cherry (*Prunus virginiana*), along with rocky steep slopes and ravines, chaparral, riparian willow (*Salix* spp.) and alder (*Alnus* spp.) thickets. It is found in mixed-conifer forests near scrubby thickets. The Virginia's warbler builds its nest on the ground in scrubby vegetation, embedded among dead leaves or in loose soil, sometimes at the base of a bush or hidden under a tussock of grass, but usually concealed by overhanging vegetation. The bird forages on the ground, as well as in foliage, and hawks insects on the wing.

Black-chinned hummingbird

Black-chinned Hummingbirds use a wide range of habitats, including riparian woodlands, lush urban vegetation, pinyon-juniper, and xeric desert washes (Kingery 1998, Baltosser and Russell 2000). In New Mexico, the species most often breeds in riparian areas dominated by cottonwood, sycamore, and willow. In southwestern New Mexico, the species is often found in relatively open areas interspersed with clumps of sycamore and cottonwood. Along the Gila River, the species nests in areas dominated by cottonwood, maple, and willow with an understory of Porter's wild lovage and great ragweed (Baltosser 1986). Along the Rio Grande, the species nests most

frequently in areas dominated by mature cottonwoods, and densities are thicker where there is a moderate to dense understory of shrubs (Hawks Aloft Inc., unpublished data). Nesting also occurs in urban areas with tall trees and numerous flowering plants.

On the Cibola National Forest this species is the foothills hummingbird that occurs on all mountain Districts up to about 7,000 ft. It is often found in mesic riparian habitat with strong deciduous component, especially Arizona Sycamore.

Broad-tailed hummingbird

Across its range, Broad-tailed Hummingbirds occupy many different vegetation types. It is generally associated with open woodlands, especially pinyon-juniper and pine-oak associations, as well as montane riparian areas and wet meadows, and areas of relatively open mixed conifers including fir, spruce, and pine (Calder and Calder 1992). In Colorado, although breeding bird atlasers recorded Broad-tailed Hummingbirds in ponderosa pine forest, it was recorded in higher densities and more frequently in areas dominated by aspen. Reports in foothill riparian, montane shrubland, and pinyon-juniper woodland also outnumbered ponderosa pine, but there is no indication of the quality of the ponderosa pine stands where breeding season observations were reported. Breeding was confirmed up to around 3,320 meters (10,900 feet) in elevation (Kingery 1998). Likewise, in New Mexico, the species also uses a variety of habitats, including pinyon-juniper woodlands, montane riparian areas and thickets, and open, mixed conifer forests. Surprisingly little research on this species has occurred over the past 20 years, and more specific data on habitat preference in New Mexico are lacking.

This mountain hummingbird is found from about 7,000 feet upwards. It frequents meadows and open forest with a shrubby component and forbs. It frequents meadows and open forests with a shrubby component and forbs. Gooseberry, figwort and Indian paintbrush are among its favorite flowers. Insects are an important part of the diet, especially when females are incubating and feeding young.

Lewis's woodpecker

Lewis's Woodpecker requires open canopy forests with large dead or decaying trees for nesting. It breeds in both lowland riparian and montane forest habitats. In New Mexico, breeding occurs most commonly in riparian woodland with large, mature cottonwoods. At higher elevations, Lewis's Woodpecker occurs in ponderosa pine forests with large trees and an open canopy. It is absent from dense ponderosa stands where fire suppression and grazing have prevented development of an open forest structure. The species also occupies burned (and sometimes selectively logged) forest areas, in the ponderosa zone and above, where large snags remain standing. Lewis's Woodpecker does not occupy some areas of apparently suitable habitat.

On the Mt. Taylor Ranger District this species occurs in mid to high elevation, riparian woodland and open ponderosa forests. In addition to the open park-like ponderosa forests with brushy understory and dead and down materials, Lewis's will also use burned forests-- and to a lesser degree oak woodlands.

Red-naped sapsucker

Until 1983, Red-naped Sapsucker was considered conspecific with Yellow-bellied Sapsucker and Red-breasted Sapsucker. In New Mexico, Red-naped Sapsuckers breed in higher montane forests and mixed woodlands, particularly aspen groves. It avoids woodland edges (Dobkin et al. 1995).

In breeding areas, this species drills sap wells in conifers, aspen or willow, and defends a constantly maintained network of wells from other species and other sapsuckers (Walters et al. 2002). It also forages for insects, particularly ants, when feeding young.

On the Cibola they are found in riparian woodland, ponderosa, mixed conifer and spruce/fir. This species prefers aspen and cottonwoods for nesting and are often found in oaks in winter.

Grace's warbler

Grace's Warbler is a pine specialist. It prefers park-like stands of mature tall pines, a habitat that has declined over time due to logging and fire suppression. In the southwest United States, it occurs primarily in ponderosa pine habitat, though Chihuahua pine and pine-oak woodlands of the Mexican Highlands are also used. Breeding may sometimes extend upslope into mixed conifer habitat (Stacier and Guzy 2002). In New Mexico, it is described as inhabiting mesa tops and canyon bottoms with ponderosa pine (Travis 1992), and may prefer areas with a Gambel oak understory (Levad 1998). In appropriate habitat in Arizona, Grace's Warbler may be one of the more abundant species (Rosenstock 1996), but its densities are as much as 50% lower in New Mexico (Stacier and Guzy 2002). In northern Arizona, the species was common on both silviculturally thinned plots and control plots (Szaro and Balda 1979). It avoids lower elevation areas, even during migration, with far fewer records from the lowlands during migration than other migrant montane species.

On the Mt Taylor RD this species is fairly common in ponderosa pine but may extend into mixed conifer if ponderosa also present.

Dusky Grouse

Regularly occurs only on Mount Taylor, where it was introduced. It may occur casually in the Magdalenas, and possibly also the San Mateos. Prefers open shrubby high meadows in summer and coniferous forest in winter. A probable sighting in the Magdalenas at 9,600 feet on 5-20-02, if true, would indicate possible breeding in the meadows on or below the summit of this range. BNA: Creating or maintaining shrubby openings might be good for the species, but excessive grazing in these openings most certainly detrimental. Florence Bailey (1928) says (but not recorded in BNA): "The Dusky Grouse is one of the most notable game birds of the region, but if overgrazing is allowed to continue and as more and more campers go the mountains, it will become lamentably scarce unless wisely protected."

Williamson's Sapsucker

Williamson's sapsucker is uncommon in Ponderosa, M/C and Spruce/Fir throughout mountain districts, especially in aspen groves, except on Magdalena RD, where it is probably rare in summer, or possibly absent. BNA: Seems to prefer aspen, utilizing live trees and snags for nesting. Also nests in pine snags, often in vicinity of open ponderosa. BNA is very specific re management guidelines: "Forest management plans should emphasize conservation of groups of large snags, rather than random assortment of variably sized snags. Patches of snags and areas of high snag density should be preserved, especially those in drainage bottoms or other low-lying areas. Fire in mixed coniferous forest that creates snags may increase breeding densities. Availability of sap trees (often large conifers) also would be important."

Hammond's Flycatcher

Although a migrant in all our mountains, it occurs only on Mount Taylor RD in summer, primarily in Ponderosa (old growth) and M/C, especially where Blue Spruce or aspen is part of the mix, but also in Middle/High Elevation Riparian, as at Rinconada, where it breeds in the

alder/oak bosque. BNA: Generally inhabits cool mesic forests of mature or old-growth development, but also found in mixed forest with aspen, alder or oak. Birds prefer intact older stands rather than merely old trees widely spaced. Woodcutting, according to a study in the Jemez Mountains, can reduce a population.

Important Bird Areas

There are no Important Bird Areas (IBAs) associated with the project area. There would be no effects/impacts on IBAs resulting from the proposed project. There is no direct association or important link between the bird communities within the proposed project site and the Rinconada Basin IBA (north of I-40).

Over-wintering Areas

Important over-wintering areas have not yet been recognized as occurring on the Forest. The project site does not provide important wintering habitat for unique avian species or a high diversity of wintering birds. Significant concentrations of birds do not occur within the general location of the project area.

Environmental Consequences

Mexican Spotted Owl

Alternative A – No Action

Effects are expected for Mexican Spotted owl under the no action alternative. No vegetation treatments could mean, thick trees in the area along with down woody debris can lead to increased risk of a stand replacing fire. This could wipe out suitable nesting and foraging habitat for the species. Indirectly stand replacing fire would also reduce the understory vegetation, which means prey species such as mice, voles, and prairie dogs could lose their habitat sources and either leave the area or die off, thus reducing Mexican spotted owl food source. This could reduce the population numbers, which would mean a reduction in population recovery.

Indirect effects are expected for the Mexican spotted owl because under this alternative decommission up to 200 miles of unauthorized roads would not occur. This could lead to increased illegal motorized use. Even with the travel management decision many users see a two track road and drive on them, whether it's legal or not. If these roads are not rehabilitated it could lead to continued use. Security zones for wildlife between the routes would be reduced even further, as the habitat becomes increasingly more fragmented. Unrestricted winter and summer use would increase disturbance (noise) impacts to wildlife incrementally over time. Impacts will become additive, as use increases, and private land development increases as well. User-created routes can be expected to increase erosion, which can have impacts to surrounding habitats far greater than just the trail surface itself (down-cutting and side channeling, as a result of heavy rains). New user-created routes would receive increased use from all types of recreation users over time adding to the current density of routes by an as yet unknown amount.

Water is very important to all species, by not doing improvements to riparian areas, streams, and springs can affect Mexican spotted owls in the long term. These areas can dry up over time if not monitored and managed properly. If the water goes away, Mexican spotted owls may also leave the area to find habitat with reliable water sources. This can lead to a decline in the overall population of Mexican spotted owls.

No effects are expected if range infrastructure improvements do not occur.

Alternative B

Direct Effects

Plan Amendment 1

No direct effects are expected from implementation of Amendment 1. It is a planning-level action, and therefore does not have site-specific effects.

Plan Amendment 2

No direct effects are expected from implementation of Amendment 2. It is a planning-level action, and therefore does not have site-specific effects.

Puerco: Vegetation Treatments

Direct effects to breeding adults, nests, eggs, and chicks from all proposed actions are not expected due to the implementation of timing restrictions for activities occurring during the breeding season. However, direct effects to non-breeding adults and juvenile owls during the non-breeding season are possible. The available information regarding seasonal migration of MSOs is limited but suggests that owls may or may not migrate away from their breeding territories during the non-breeding period.

The reasons why an owl might migrate are generally unknown, but some research has suggested that migration down-slope in elevation may facilitate energetic savings in maintaining homeostasis and hunting for small mammals, which comprise the bulk of their diet (Ward & Block 1995). Other research has found winter prey biomass to be ~8 times greater within wintering areas than within the breeding areas (Block et al. 2005). Although circumstantial, the evidence suggests migration may be driven by food availability. Therefore it is possible for owls to be present within treatment areas during treatment implementation.

Prescribed thinning and burning activities during the non-breeding period may cause the following effects:

- Mortality or injury of individuals from felling of trees occupied by owls;
- Harassment of individuals from fire activity; Prescribed burning may cause smoke to settle into suitable MSO habitat within the mixed conifer and ponderosa pine and would limit foraging in or outside of those habitats;
- Mortality or injury of individuals due to collisions between foraging owls and heavy equipment used for felling trees or other implementation-related vehicular traffic;
- Disturbance or removal of roost trees from felling and prescribed fire activities.
- Harassment of individuals from noise and habitat disturbance leading to alteration of foraging activities and/or the vacating of foraging habitat.

The effects described here would not apply to breeding owls. Wintering owls are difficult to detect or monitor because they are nocturnal and do not respond to playback or calling during the wintering period. The effects to wintering owls are therefore insignificant (not measurable, detectable, or able to be evaluated).

Puerco: Roads

As aforementioned, it is possible for owls to be present within the project area during implementation. The direct effects of road construction, maintenance, and use by various vehicles and heavy equipment may include:

- Mortality or injury of individuals due to collisions between foraging or roosting owls and heavy equipment used for mastication, tree felling, logging, or other implementation-related vehicular traffic.
- Harassment of individuals from noise and habitat disturbance from vehicular traffic and/or road construction/maintenance activities leading to alteration of foraging activities and/or the vacating of foraging habitat.

The effects described here would not apply to breeding owls. Wintering owls are difficult to detect or monitor because they are nocturnal and do not respond to playback or calling during the wintering period. The effects to wintering owls are therefore insignificant.

Puerco: Range Improvements

As aforementioned, it is possible for owls to be present within the project area during implementation. The direct effects of range improvements are related to the scale and method of implementation and may include mortality, injury, and/or harassment from vehicular traffic and heavy equipment use in foraging habitat during the non-breeding season. These effects are insignificant and discountable.

Puerco: Watershed Improvements

Direct effects to MSOs from watershed improvements would be avoided by the use of timing restrictions on implementation to avoid disturbance during the breeding period. Activities within 300 feet of riparian areas and within PACs would not be allowed during the breeding season. It is possible owls may use riparian corridors and habitat during the wintering months for roosting and foraging. Human presence and noise disturbance from machinery could cause harassment of individuals. These effects are unlikely, and are not expected to significantly affect the MSO population within the project area.

Indirect Effects

Plan Amendment 1

Plan Amendment 1 would allow the Cibola National Forest to implement the Mexican Spotted Owl Recovery Plan First Revision (USFWS 2012) using the best available scientific knowledge of the species, which would allow the forest to more effectively manage owl habitat through restoration activities to address threats to the species, most notably the increased risk of stand-replacing wildfires.

The revised plan recognizes that current forest conditions have the potential to sustain landscape-scale stand-replacing fires that would alter owl habitat, and that broad-scale, high-severity, stand-replacing fires have had, and will likely continue to have, long-term effects on watershed and

forest function (Fule et al. 2004). Despite the variability of fire effects and existing gaps in knowledge regarding short- and long-term effects on habitat and owl responses to wildland fire, stand-replacing crown fires pose a major threat to MSOs. Additionally, most climate-models predict hotter and drier conditions in the southwestern U.S. in future decades, which will increase susceptibility of forests to large-scale fires. The revised recovery plan provides management recommendations to reduce fire risk to PACs and recovery habitat valuable to spotted owls while maintaining the integrity of nest/roost core areas. These recommendations can be found in Appendix C of the revised recovery plan and have been incorporated into the Puerco proposed forest restoration actions with the potential to affect MSOs or their habitat.

Implementation of this plan amendment would have the following indirect effects on the owl and its habitat:

- Deferring management activities from PACs and core areas during the breeding season (March 1 to August 31) would avoid direct impacts to breeding owls and their nest sites.
- Conducting mechanical or prescribed fire (light burning of surface and low-lying fuels) vegetation treatments within PAC areas outside of the breeding season would reduce unhealthy fuel loadings within owl nesting habitat and increase the site's resiliency to stand-replacing wildfires long-term.
- Allowing low-intensity prescribed fire treatments to enter nest core areas outside of the breeding season would result in short-term negative effects to core areas (short-term loss of surface vegetation and alteration of prey habitat in the nest core area). Treatments would be strategically placed to minimize the risk of high-severity fire effects to the core area, while mimicking natural mosaic burn patterns.
- Monitoring treatment effects on habitat characteristics and owl nesting occurrence/success would inform large-scale assessment of forest restoration and fuels-reduction treatments on the species as a whole and therefore contribute to improved range-wide management of the species and its habitat.
- Planning and implementing management activities in accordance with the desired conditions for mixed-conifer and pine-oak forest types with respect to the appropriate Ecological Management Units would move habitat components important to the owl (e.g., basal area, tree density, age class composition, canopy cover) toward the desired state (described in the revised recovery plan), thus maintaining or increasing suitable foraging and/or nesting/roosting habitat.
- The revised plan provides clarification on the following guideline: Design and implement management treatments within Forested Recovery Foraging/Non-breeding habitat so that most hardwoods, large snags (>18 in dbh), large downed logs (>18 in diameter at any point), trees (>18 in dbh) are retained, unless this conflicts with forest restoration and/or owl habitat enhancement goals. Treatments adequate to meet fuels and restoration management objectives in Recovery Habitats may result in the short-term loss of some habitat components in areas that could be occupied by spotted owls. These losses are acceptable where they result from actions that otherwise further longer-term protection and sustainability of forests occupied by owls. When implementing this guideline, managers would strive to achieve a balance between retaining a sufficient density and distribution of important features that

spotted owls may require and reducing the risk of losing existing roosting and nesting habitat from insect epidemics, stand replacing fires, and other stochastic events.

Previous wording of this guideline (USDI FWS 1995) was interpreted to mean that trees >18-in dbh may not be removed. That is no longer the intent. However, large trees are a key habitat correlate for owls. Under the proposed action, removal of such trees would be done judiciously and only when truly necessary to meet specific resource objectives.

Plan Amendment 1 does not have effects on a site-specific level. Rather, its effects are broad and beneficial at the planning level, which does not allow for quantification of project level effects.

Plan Amendment 2

Since the Forest Plan was written, new information has emerged and better guidance has been developed for the management of ponderosa-pine and pine-oak ecosystems. Additionally, the Cibola aims to align project activities with the best available science for northern goshawk management, particularly with regard to interspaces. Reynolds et al. (2013) have shown that frequent-fire forests were historically characterized by the presence of interspaces of variable sizes and shapes. The Forest Plan provides guidelines to manage for uneven-aged stand conditions, but does not provide guidelines for the management of interspaces at the fine-scale. Plan Amendment 2 as proposed here would do that by applying the following vegetation management both within and outside of goshawk post-fledging family areas:

- add the desired percentage of interspace within uneven-aged stands to facilitate restoration,
- add the interspace distance between tree groups,
- add language clarifying where canopy cover is and is not measured,
- allow up to 33,560 acres to be managed for an open reference condition which affects canopy cover guidelines for VSS 4 through VSS 6 groups and reserve trees, and
- add a definition to the forest plan glossary for the terms interspaces, open reference condition, and stands.

Implementation of Plan Amendment 2 would allow the Cibola to apply the best available science to restoration activities aimed at moving ecosystems toward appropriate reference conditions as well as northern goshawk habitat management. These translate to long-term beneficial effects to ecosystem health.

Plan Amendment 2 does not have effects on a site-specific level. Rather, its effects are broad and beneficial at the planning level, which does not allow for quantification of project level effects. Furthermore, management for Mexican spotted owls and their habitat would be prioritized over management for northern goshawks in habitats important to the owl as long as the owl remains listed and potentially thereafter, and goshawk management would not be implemented where it would lead to adverse impacts to the owl.

Puerco: Vegetation Treatments

Effects to PACs

The seven PACs within the Puerco project area comprise 5,865 acres. Of that, 2,841 acres are proposed for vegetation treatment (48%). These treatments would occur on 6.2% of the total PAC area within the entire Cibola National Forest (Table 16). The treatment types that are

proposed in PACs include: 1) Thinning with lop and scatter or mastication methods, and low to moderate intensity prescribed fire (~13% of total PAC area within Puerco project would be treated in this manner), and 2) Thinning, commercial product removal, and low to moderate intensity prescribed fire (~35% of total PAC area within Puerco project would be treated in this manner). The proposed acreage per PAC can be seen in Table 17. On average, less than 250 acres of PAC habitat would be treated per year. This is expected to balance the need to reduce the risk of crown fire while allowing for monitoring and feedback loops that will allow management to be adaptive.

While the long-term intent of these vegetation treatments is to improve habitat for the owl and accomplish other ecosystem objectives to improve forest health and resiliency to large-scale disturbances such as stand-replacing wildfire, insects and disease, and the effects of climate change, the treatments are expected to have adverse effects to PACs, at least in the short term. Basal area and canopy cover would be reduced, and the density of large trees would decrease. Implementation of treatments within PACs would likely take several years to complete, with thinning and commercial activities occurring first, followed by prescribed fire later. Thinning activities in PACs would result in removal of trees using chainsaws and hand crews, and cut materials and slash would be distributed across the surface and later treated with low to moderate intensity prescribed fire. The areas identified for each type of treatment were based on forest stand inventory data and modeling. They are reflected in the existing and desired conditions section of this document as having departed from natural healthy forest conditions. Prescriptions would not reduce suitable habitat in the long term to below what the Forest Plan or Mexican Spotted Owl Recovery Plan First Revision (2012) recommend.

Spotted owls are highly site-tenacious, returning repeatedly to the same nesting site. The proposed treatments have the potential to remove and/or alter suitable nesting habitat, which may result in loss of a pair's reproductive capability and/or loss of the pair altogether for lack of available foraging or nesting habitat. Simply put, owls may not return to this site post-treatment. Thinning treatments would reduce basal area within PACs, but not below 30% in mixed-conifer and pine-oak habitats for size classes 30-46 cm DBH and >46 cm DBH. An old-tree retention strategy would be implemented throughout the project. All trees > 18" DBH with no sign of insect disease or damage and all trees greater than 24" DBH would be retained. In mixed-conifer, tree density may range from 20-100 trees/acre and 30-120 ft² of basal area/acre, which meets the minimum requirements for recovery nest/roost habitat.

Opening up or fragmenting the habitat may similarly affect the species by introducing increased predation or parasitism. Surface and vegetation disturbance caused by prescribed fire, the use of heavy equipment, machinery, chainsaws, vehicle traffic, and logging trucks/equipment may leave treatment sites vulnerable to invasion by noxious/invasive species. These effects would be mitigated by applying standard operating procedures for the washing of equipment prior to entering sites as well as re-seeding of disturbed areas using an appropriate native and certified weed-free seed mix.

Protection of owl habitat does not always mean a hands-off approach. In this case, protection of PACs requires active management to reduce fuel loads and fuel continuity in areas adjacent to and within PACs to reduce potential for high-severity and stand-replacing wildfires. Strategic treatments in surrounding Recovery Habitat are also planned to minimize the necessary treatment within PACs. Treatments have also been planned to balance fuels reduction goals with short- and

Puerco Collaborative Forest Landscape Restoration Project
3. Environmental Consequences

long-term conservation of owl habitat, recognizing that drastic alterations to PACs may render them of lesser value for MSOs, at least in the short term.

In the long term, the proposed treatments emphasizing the following management guidelines are expected to have the following beneficial impacts to owl habitat within PACs:

Veg Treatment Design Feature	Effects to PACs & Recovery Nest/Roost Habitat
Manage for a diversity of patch sizes with larger patches near activity center and a mix of sizes toward periphery; Strive for between-patch heterogeneity.	Would enhance spatial heterogeneity, provide nest/roost options, provide varied microclimate options, and create edges for prey species.
Manage for horizontal and vertical habitat heterogeneity within patches, including tree species composition.	Would provide roosting options, thermal and hiding cover for the owl, and habitat for a variety of prey species
Manage for tree species diversity with a mixture of hardwoods and shade-tolerant species.	Would provide habitat and food sources for diversity of prey species, roosting options, and perches and hiding cover for young during flight development. Would increase probability of some tree species setting seed in a given year.
Manage for diverse composition of vigorous native herbaceous and shrub species.	Would provide sustainable habitat for a variety of prey species.
Manage for opening sizes between 0.1 – 2.5 acres. Openings would be small in nest/roost patches, but larger in rest of PAC.	Small canopy gaps within forested patches would provide for prey habitat diversity.
Manage for minimum canopy cover of 40% in pine-oak and 60% in mixed conifer.	Would provide thermal environment needed for nesting/roosting and prey habitat
Manage for a diversity of tree sizes with a goal of having trees $\geq 16''$ DBG contributing $\geq 50\%$ of the stand basal area.	Would provide structure for desired condition of nesting, roosting, and foraging habitats. Emphasizing large trees would provide for large snags and logs.

Despite the expected beneficial long-term effects of the proposed vegetation treatments and restoration effort within the project area, the proposed action may affect, and is likely to adversely affect the MSO due to the short-term negative effects to PAC habitat by a reduction of BA, canopy cover, and tree density, and due to the possibility of a reduction in long-term nest site fidelity. The use of heavy machinery to remove trees and the use of prescribed fire are associated with significant short-term soil and vegetation disturbance with the potential to increase surface runoff, erosion, and prey habitat disturbance/loss. These effects may be reduced by the use of best management practices such as operating outside of the rainy season, interim reclamation of roads and erosion issues, re-seeding soils following disturbance, and preventing introduction of invasive species.

PAC Name	PAC size	PAC Area Proposed	% total project	% total CNF
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Puerco Collaborative Forest Landscape Restoration Project
3. Environmental Consequences

	(acres)	for Tx (acres)	PAC area	PAC area
6-Mile	1,185	796	67	1.7
Agua Remora	736	155	21	0.3
Brennan Spring	624	425	68	0.9
Foster	954	686	72	1.5
Hogback	664	266	40	0.6
Milk Ranch	1006	334	33	0.7
Smith Canyon	696	179	26	0.4
Total	5,865	2,841	48	6.2

Table 3.5.11. Description of PAC size within the project area, area within PACs that is proposed for treatment, proportion of PACs proposed for treatment, and proportion of proposed PAC treatment acres out of all PACs within the CNF.

PAC Name	Treatment Acres		Total PAC Acres
	[acres (% of PAC)]		
	Thin w/L&S or Masticate; Burn	Thin; Commercial Removal; Burn	
6-Mile	172 (15)	622 (52)	1,185
Agua Remora	37 (5)	118 (16)	736
Brennan Spring	246 (39)	178 (29)	624
Foster	197 (21)	492 (52)	954
Hogback	57 (9)	209 (31)	664
Milk Ranch	71 (7)	263 (26)	1,006
Smith Canyon	0 (0)	179 (26)	696
			5,865

Table 3.5.12. Acres of treatment proposed within each PAC and their proportion to total PAC acres.

Effects to Recovery Habitat

Forested Recovery Habitat. Forested recovery habitat is forested habitat occurring in mixed-conifer and pine-oak forests outside of PACs, and can be either foraging or nest/roost habitat. There are approximately 180 acres of nest/roost recovery habitat within the project area and ~27,700 acres of foraging recovery habitat. The treatment types and associated acreage proposed within these habitats can be seen in Table 3.5.13 below. The effects from treatment designs to nest/roost recovery habitat mimic the effects on PACs, and can be seen in the previous section (*Effects to PACs*).

Implementation of treatments within foraging recovery habitat would take several years to complete, with thinning/mastication and public/commercial removal activities occurring first, followed by prescribed fire. Thinning activities would result in removal of trees using chainsaws and hand crews, and cut materials and slash would be distributed across the surface and later treated with low to moderate intensity prescribed fire. The areas identified for each type of treatment were based on forest stand inventory data and modeling. They are reflected in the existing and desired conditions section of this document as having departed from natural healthy forest conditions. Prescriptions would not reduce suitable habitat in the long term to below what the Forest Plan or Mexican Spotted Owl Recovery Plan First Revision (2012) recommend.

The guidelines set forth in the revised owl recovery plan emphasize management that retains and promotes the growth of large trees, including hardwoods. The proposed treatments would emphasize retention of key habitat elements in foraging recovery habitat including most hardwoods, large snags (>18" dbh), large downed logs (>18" dbh), and trees (>18" dbh), unless it conflicts with forest restoration and/or owl habitat management goals. Treatments adequate to meet fuels and restoration management objectives in recovery habitat may result in the short-term loss of some habitat components in areas that could be occupied by owls. These effects are considered acceptable because they result from actions that otherwise further longer-term protection and sustainability of forests occupied by owls. Large trees are a key habitat correlate for owls, and removal of such trees would be done judiciously and only when truly necessary to meet specific resource objectives.

Vegetation Treatment Type	Proposed Tx in Recovery Habitat-Forage		Proposed Tx in Recovery Habitat-Nest/Roost	
	Acres	% Total Recovery Habitat	Acres	% Total Rec-Nest/Roost Habitat
Burn Only	5927	21	176	97
Low thin; LS; No Mast; Burn OK	1004	3	0	0
Low thin; LS; No Mast; No Burn	1911	7	4	2
Public or Commercial Removal; Burn	88	0.3	0	0
Thin w/LS or Mast; Burn	3421	12	0	0

Puerco Collaborative Forest Landscape Restoration Project
3. Environmental Consequences

Thin; Commercial Removal; Burn	15360	53	0	0
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Table 3.5.13. Proposed vegetation treatments (acres) proposed in Recovery Habitat (forage) and Recovery Habitat (Nest/Roost) within the Puerco project area. Areas within PACs proposed for treatment are included for analysis purposes. Proportions of proposed treatments out of total recovery habitat are included.

Riparian Recovery Habitat:

Riparian recovery habitats are considered a key habitat for owl recovery and consist of riparian forests outside of PACs that could frequently be used for foraging, roosting, daily movements, dispersal, and potentially for nesting. Restoration activities are proposed to restore ~19 springs and reestablish or protect native plant species which currently exist or have been documented to exist in the area. At least 12 of these springs exhibit downward trends or static-degraded conditions. An additional 250 acres of riparian meadows and stream habitat are currently non-functioning or functioning-at-risk, due to a lack of adequate vegetation, landform, and woody material needed to filter sediment, dissipate stream energies, and support recharge to groundwater.

Proposed activities would have the following effects to riparian habitat:

Management Action	Effects to Riparian Recovery Habitat
Manage for Proper Functioning Condition (as defined in USDI BLM 1998).	Would reducing erosion, allow for regeneration of riparian tree cover, and provide dense ground cover for small mammal prey species.
Manage for species diversity.	Would provide cover for owl prey species and potential nest/roost sites for owls.
Manage grazing effects.	Would reduce trampling and/or herbivory of riparian vegetation and allow for regeneration of riparian tree cover and prey species habitat.
Minimize construction activities (e.g., road or trail building)	Would minimize riparian habitat disturbance or loss. In cases where management needs are demonstrated, construction activities could have short-term negative effects to achieve long-term beneficial effects.
Selective tree removal.	Would reduce encroachment from noxious/invasive plants, and allow regeneration of native riparian tree cover. Prescribed thinning of trees and shrubs would restore proper functioning condition and reduce the risk of stand-replacing fire.

Table 3.5.14. Effects to Riparian Recovery Habitat

Puerco: Roads

The proposed action includes rehabilitation of up to 200 miles of unauthorized roads. These roads currently exist and are being used by the public, but were not designed or constructed according to any FS road standards. Due to this fact, they have greater potential to negatively affect the surrounding environment through degradation of wildlife habitat, vegetation or soil productivity, or interruption of natural hydrologic processes. Where these roads occur within owl PACs, Recovery Habitat, or Critical Habitat, they may currently be causing loss of surface vegetation and/or soil productivity, which may reduce the quality of available foraging habitat.

These roads also provide access for illegal wood product removal activities. The proposed action includes rehabilitation of these roads, which would reduce the loss of nesting, roosting, and foraging habitat. Roads would be designed to meet FS standards, which would reduce soil and vegetation loss, and improve vegetative conditions where roads occur. In cases where heavy equipment are used to implement this action, some soil disturbance would occur, but these actions would ultimately result in decreased soil compaction and erosion and improve drainage. Mitigation measures on disturbed soils would include seeding, mulching, and erosion control measures where appropriate. Assuming an influence area of 21 ft, this would result in 509 acres of improved soil condition. Improved soil conditions would improve the capability of soils near roads to support desired native vegetation.

The use of closures to these areas would reduce or even eliminate vehicular traffic. Bringing certain roads up to the appropriate agency road engineering standards for authorized travel would improve safety of the public as well as agency personnel and reduce the risk of soil erosion and habitat loss in the surrounding area.

Puerco: Range Improvements

Various range improvements have been proposed as part of this restoration effort to more effectively manage the impacts from livestock grazing on the ecosystem as a whole. Much of the proposed work includes maintenance or improvement of existing features such as earthen tanks, pasture fences, cattle guards, corrals, water sources, and other mechanisms for grazing management. These features occur in previously disturbed areas. Any activities associated with maintaining or improving them would occur outside of the MSO breeding period.

The use of heavy equipment would have the potential for affecting owls during the non-breeding period by way of relatively small amounts of surface disturbance to potential foraging habitat. These effects are expected to be so small as to be considered insignificant and discountable. Improvement of features such as pasture boundary fences, stock waters, and cattle guards would allow for the prescribed distribution of cattle throughout the grazing season as written in the grazing permits. Proper grazing management would lead to long-term benefits for owl nesting, roosting, and foraging habitats where they overlap. It would prevent overutilization in some areas, allow resting periods for pastures to allow for recruitment, growth, and vigor of native vegetation, prevent soil erosion, and improve habitat for owl prey species.

Other proposed range improvements include erosion control measures. Where these actions utilize heavy equipment (and occur in owl habitats), they may cause temporary soil disturbance

and removal of vegetation, but would be mitigated by seeding, mulching, and/or erosion control where appropriate. The effects from range improvements would lead to improved long-term watershed condition, which would benefit habitat for the owl and their prey.

Puerco: Watershed Improvements

Approximately 19 springs are proposed for improvement along with 250 acres of riparian habitat and 121 acres of eroding areas. Two springs occur within PAC boundaries, and ~5 others occur along the periphery of PACs. Much of the riparian habitat is functioning-at-risk. Spring restoration, riparian fencing, gully treatments (erosion control), and road drainage improvements would allow for soil functions to improve, including reduced compaction, increased vegetation, and less erosion. All these effects would lead to increased soil stability, higher retention of water, cooler microclimates, increased cover of native riparian vegetation, reduction of noxious weeds, and therefore improved foraging habitat for owls. In the short term, negative effects would include disturbance to soils and vegetation from heavy equipment and hand crews. These effects are not expected to be significant. Disturbed areas would be re-seeded using a native weed-free seed mix approved by FS resource specialists. Implementation of watershed improvement actions would improve the functioning condition and reduce erosion of riparian areas within the project area that may be used by owls, allowing recruitment of native riparian vegetation in recovery habitat.

Effects to MSO Critical Habitat

Primary **constituent elements** are the physical and biological features that are essential to conservation of the species and that may require special management considerations or protection. For MSOs, these include those physical and biological features that support nesting, roosting, and foraging. They are listed below (USFWS 2012) along with effects from the proposed action.

There are 16,910 acres of Critical Habitat proposed for vegetation treatments in the project area. These acres comprise ~8% of the CP-2 EMU (203,000 acres). The breakdown of acres by treatment type can be seen in Table 3.5.13.

Approximately 73 miles of proposed haul routes fall within Critical Habitat. Forty of those miles are unauthorized roads and proposed for improvements to bring them to the proper Forest Service engineering standards.

Range improvements that would occur within Critical Habitat include cleaning sediment out of 5 cattle guards, and the implementation of rehabilitation on 1 drainage, which upstream sediment deposition has compromised.

Approximately 120 acres of riparian habitat and 1 spring occur within Critical Habitat. The spring is in properly functioning condition.

Vegetation Treatment Type	Proposed Tx in CH	% of CH in Puerco Project	% of CH Unit CP-2	% of Total MSO CH
Burn Only	6425	36	3	0.07

Puerco Collaborative Forest Landscape Restoration Project
3. Environmental Consequences

Low thin; LS; No Mast; Burn OK	844	5	0.4	0.008
Low thin; LS; No Mast; No Burn	2670	15	1.3	0.03
Public or Commercial Removal; Burn	88	0.5	0.04	0.0009
Thin w/LS or Mast; Burn	1764	10	0.8	0.02
Thin; Commercial Removal; Burn	5119	29	2.5	0.05

Table 3.5.15. Proposed vegetation treatments (acres) proposed in Critical Habitat within the Puerco project. Areas within PACs proposed for treatment are included for analysis purposes. Proportion of proposed treatments within Puerco project area Critical Habitat, Unit CP-2 of Critical Habitat, and total MSO Critical Habitat are included.

Effects of proposed actions to each of the primary constituent elements are described below:

1. FOREST STRUCTURE:

- **A range of tree species, including mixed conifer, pine-oak, and riparian forest types, composed of different tree sizes reflecting different ages of trees, 30-45% of which are large trees with a trunk diameter of greater than or equal to 0.3 m (12 in) when measured at 1.4 m (4.5 ft) from the ground.**

Effects:

Plan Amendment 1: This amendment would allow the Cibola to implement the management of PCEs recommended by the revised owl recovery plan. This would have wholly beneficial effects to this PCE.

Plan Amendment 2: This amendment would be precluded by Plan Amendment 1 where managing for MSO habitat. Nonetheless, improving forest health and resiliency to disturbances would indirectly benefit critical habitat through uneven-aged management and retention of large trees.

Puerco Veg Treatments: Proposed treatments would incorporate design features to 1) retain this PCE within critical habitat, and 2) attain the features of this PCE in critical habitat where they are not present, but attainable. To meet targeted hazardous fuels reduction levels, some trees >12" dbh may be lost from thinning and prescribed fire implementation, but the loss would be minimal as prescriptions emphasize retention of large trees.

Puerco Roads: Rehabilitation or improvement of 200 miles of unauthorized roads would result in either a reduction of road miles or no net gain of road miles on the landscape. Mileage that is closed and rehabilitated would be treated to attain the features of this PCE where they are attainable.

Puerco Range Improvements: Cleaning sediment out of 5 existing cattle guards would improve the drainage and functioning of the features. Rehabilitation of 1 drainage would reduce sediment deposition and erosion, and improve drainage. Effects to this PCE are expected to be insignificant.

Puerco Watershed Improvements: Proposed improvements would emphasize diversity and varied age classes of riparian plant species, which are both components of managing riparian areas toward proper functioning condition and advanced ecological status where possible. Fencing projects would remove livestock and allow recovery of riparian vegetation. Erosion control projects would aggrade channels and drainages, reduce sediment transport, and stabilize soils to allow for recovery of vegetation in all these habitat types.

- **A shaded canopy created by the tree branches and foliage covering greater than or equal to 40% of the ground.**

Effects:

Plan Amendment 1: This amendment would allow the Cibola to implement the management of PCEs recommended by the revised owl recovery plan. This would have wholly beneficial effects to this PCE.

Plan Amendment 2: This amendment would be precluded by Plan Amendment 1 where managing for MSO habitat.

Puerco Veg Treatments: Prescribed forest thinning and fire would reduce ladder fuels and manage interspaces, which could reduce canopy cover. However, in suitable owl habitat, prescriptions would strive to maintain this PCE where it exists and restore or enhance habitat to meet this criterion for canopy cover where appropriate.

Puerco Roads: If trees are removed for road maintenance or construction, then canopy cover would be reduced. This effect is expected to be insignificant as all roads being utilized for this project currently exist and would likely only need minimal improvements. Furthermore, many roads would be decommissioned, which would allow for regeneration of woody species in roaded areas and therefore increased canopy cover in the future.

Puerco Range Improvements: Range improvements are unlikely to involve removal of trees (i.e., reduction in canopy cover), therefore effects from such projects on this PCE are discountable.

Puerco Watershed Improvements: Watershed improvements are generally aimed at repairing erosion, reducing erosion potential, and improving riparian functioning conditions. These activities focus on increasing foliar (riparian) cover, and would therefore have beneficial effects on this PCE.

- **Large dead trees (i.e., snags) with a trunk diameter of at least 0.3 m (12 in) when measured at 1.4 m (4.5 ft) from the ground.**

Effects:

Plan Amendment 1: This amendment would allow the Cibola to implement the management of PCEs recommended by the revised owl recovery plan. This would have wholly beneficial effects to this PCE.

Plan Amendment 2: This amendment would be precluded by Plan Amendment 1 where managing for MSO habitat. However, snags would remain an important habitat component and would be maintained for a variety of wildlife that uses them for cavity nesting as well as foraging and perching.

Puerco Veg Treatments: Proposed vegetation treatments would emphasize retention of at least 2 snags $\geq 12''$ dbh per acre, 3 large downed logs $\geq 12''$ dbh per acre, woody debris levels of 5-7 tons of $\geq 3''$ dbh per acre of woody material in forested habitat. Snags and logs that do not compromise fire fighter safety would be left. Lighting techniques that allow for the retention of large logs and snags would be used. These effects would benefit this PCE.

Puerco Roads: Retention of snags during implementation would be emphasized. It is possible for large snags to be removed for road maintenance/construction or for safety reasons. This effect is expected to be insignificant as all roads being utilized for this project currently exist and would likely only need minimal improvements.

Puerco Range Improvements: It is possible for large snags to be removed during implementation of range improvement projects for safety reasons. This effect is unlikely and expected to be insignificant.

Puerco Watershed Improvements: It is possible for this size class of snags to be located in close proximity to riparian areas or corridors. It is unlikely that these snags would be removed as part of any watershed treatment, therefore effects are expected to be discountable.

2. MAINTENANCE OF ADEQUATE PREY SPECIES:

• High volumes of fallen trees and other woody debris.

Effects:

Plan Amendment 1: This amendment would allow the Cibola to implement the management of PCEs recommended by the revised owl recovery plan. This would have wholly beneficial effects to this PCE

Plan Amendment 2: This amendment would be precluded by Plan Amendment 1 where managing for MSO habitat.

Puerco Veg Treatments: Proposed vegetation treatments would emphasize retention of at least 3 large downed logs per acre and woody debris levels of 5-7 tons per acre of $\geq 3''$ dbh woody material in forested habitat. Logs that do not compromise fire fighter safety would be left. Lighting techniques that allow for the retention of large logs would be used.

Puerco Roads: Downed woody debris may need to be moved out of roadways or during road improvements to allow for passage of heavy equipment or logging vehicles. These effects would be insignificant. At the time of road decommissioning, road beds would be decompacted and obliterated to allow for natural or assisted revegetation, and may incorporate the use of slash or other woody debris to benefit this PCE.

Puerco Range Improvements: Logs or woody debris that do not compromise the implementation of range improvement projects or worker/public safety would be left. These effects are expected to be insignificant.

Puerco Watershed Improvements: Watershed improvements such as gully treatments would result in a reduction in sediment transport from uplands and improved soil conditions, which would allow for better retention of fallen trees and woody debris on hill slopes.

• A wide range of tree and plant species, including hardwoods.

Effects:

Plan Amendment 1: This amendment would allow the Cibola to implement the management of PCEs recommended by the revised owl recovery plan. This would have wholly beneficial effects to this PCE

Plan Amendment 2: This amendment would be precluded by Plan Amendment 1 where managing for MSO habitat.

Puerco Veg Treatments: The desired conditions include tree species diversity, especially with a mixture of hardwoods and shade-tolerant species as well as a diverse composition of vigorous native herbaceous and shrub species. The range of tree species is expected to remain the same - mixed conifer, pine-oak, and riparian forest types will be left within the project boundary. Implementation of vegetation treatments to encourage recruitment and healthy populations of diverse vegetation would benefit this PCE.

Puerco Roads: Use and maintenance of roads would cause soil compaction and increased sediment yields in these areas. Through the closing and restoration of ~200 miles of unauthorized routes within the project area, soil compaction and erosion would be decreased. Assuming an influence area of 21 feet, this would result in 509 acres of improved soil condition, which could support regeneration by high diversity of herbaceous and woody species.

Puerco Range Improvements: Range improvements are expected to have an insignificant effect on vegetation and ground cover, therefore should not negatively influence plant species diversity.

Puerco Watershed Improvements: Watershed improvements such as noxious weed removal, vegetation planting, fence projects, and erosion control support plant species diversity, therefore effects to this PCE would be beneficial.

- **Adequate levels of residual plant cover to maintain fruits and seeds and allow plant regeneration.**

Effects:

Plan Amendment 1: This amendment would allow the Cibola to implement the management of PCEs recommended by the revised owl recovery plan. This would have wholly beneficial effects to this PCE

Plan Amendment 2: This amendment would be precluded by Plan Amendment 1 where managing for MSO habitat.

Puerco Veg Treatments: Treatments (both mechanical and prescribed fire) are expected to keep the 30%-45% range of large diameter trees (12 inches or greater) within the critical habitat boundary, with desired conditions increasing the percentage in future years, along with a range of tree species (mixed conifer, pine-oak, and riparian forest). Canopy cover will be opened up, with some areas less than 40% but as vegetation grows back that canopy will increase cover to over 40%. Short term negative effects are expected from ground disturbing activities and prescribed fire. Long-term beneficial effects are expected due to resulting increased sunlight to the ground level and increased plant diversity for adequate levels of residual plant cover to maintain fruits and seeds for prey species as well as increase overall vegetation within the area. Snags and dead trees 12" or greater when measured at 4.5' from the ground will be left after treatments to provide cover for prey species.

Puerco Roads: The use, maintenance, and improvement of roads generally does not provide adequate ground cover to allow for plant regeneration mainly due to soil compaction and sediment transfer. Where roads are maintained long term, they would have negative impacts on this PCE. Where they are decommissioned, soils would be decompacted, closed, and/or be revegetated through natural or artificial means, which would increase plant cover and benefit this PCE in those places in the long term.

Puerco Range Improvements: Where surface vegetation is removed during implementation of range improvements, residual plant cover would be reduced. These effects are expected to be insignificant.

Puerco Watershed Improvements: Watershed improvements such as noxious weed removal, vegetation planting, fence projects, and erosion control support increased plant cover, therefore effects to this PCE would be beneficial.

3. CANYON HABITAT (one or more of the following):

- **Presence of water (often providing cooler and often more humid conditions than the surrounding areas).**

Effects:

Plan Amendment 1: This amendment would allow the Cibola to implement the management of PCEs recommended by the revised owl recovery plan. This would have wholly beneficial effects to this PCE.

Plan Amendment 2: This amendment would be precluded by Plan Amendment 1 where managing for MSO habitat.

Puerco Veg Treatments: Vegetation treatments in uplands and areas that drain into canyon habitats may affect the presence of water. Prescribed thinning and fire activities would reduce vegetative cover, at least in the short term, potentially leading to higher amounts of surface run-off and decreased shading on the landscape. Trees within and adjacent to channels or riparian areas in canyons would be retained, except for selected removal determined to be beneficial. Channels or drainages containing stringers of ponderosa pine would be retained as tree groups, and openings would not be created where stream channels are present or on concave slopes leading into canyon habitat. These BMPs would buffer canyons from the negative effects of thinning and burning.

Puerco Roads: Road improvements to ~42 miles of unauthorized (user-created/non-engineered) roads would lead to improved drainage and reduced sediment transfer near roads by way of proper grading and installation of low-water crossings and water bars. Improved drainage would improve water retention in the surrounding ecosystem and therefore benefit this PCE.

Puerco Range Improvements: Cleaning sediment out of existing cattle guards is routine maintenance, and would improve road drainage as well as maintain permitted livestock distribution by pasture.

Puerco Watershed Improvements: Approximately 19 springs are proposed for improvement along with 250 acres of riparian habitat and 121 acres of eroding areas. Some of these areas may be associated with canyons. Much of the riparian habitat is functioning-at-risk. Spring

restoration, riparian fencing, gully treatments (erosion control), and road drainage improvements would allow for soil functions to improve, including reduced compaction, increased vegetation, and less erosion. All these effects would lead to higher retention of water, cooler microclimates, and therefore improved foraging habitat for owls.

- **Clumps or stringers of mixed-conifer, pine-oak, piñon-juniper, and/or riparian vegetation.**

Effects:

Plan Amendment 1: This amendment would allow the Cibola to implement the management of PCEs recommended by the revised owl recovery plan. This would have wholly beneficial effects to this PCE

Plan Amendment 2: This amendment would be precluded by Plan Amendment 1 where managing for MSO habitat. Where MSO foraging habitat overlaps with Northern Goshawk habitat, management of interspaces would be conducted in a manner that preserves clumps or stringers of mixed-conifer, pine-oak, PJ, and riparian vegetation to maintain or enhance this PCE. This PCE would not be altered in a way that would decrease its habitat value to MSO.

Puerco Veg Treatments: Vegetation treatments would be conducted so as to maintain or improve clumps and stringers of mixed-conifer, pine-oak, PJ, and riparian vegetation. These habitats may require thinning and burning, which would have short term negative effects such as reduction in tree density from thinning, temporary removal of understory vegetation from burning, and alteration of soil microclimates in the short term. Long term benefits of treatments of this PCE include increased resilience to ecosystem disturbances and long term maintenance of this habitat characteristic.

Puerco Roads: Where roads occur in clumps or stringers, effects would include soil compaction, loss of understory vegetation within the road corridor, and altered microsite soil conditions. These effects are expected to be insignificant as they would generally not be large enough to lead to habitat fragmentation. Furthermore, decommissioning of roads would restore and revegetate compacted soils and reduce soil disturbance in the areas where they occur.

Puerco Range Improvements: Where range improvements occur within clumps or stringers, these habitats may be fragmented. These actions would be implemented in a manner which avoids or minimizes disruption of continuous clumps or stringers of woody habitats. These effects are expected to be insignificant.

Puerco Watershed Improvements: Riparian restoration actions such as fencing, riparian planting, and noxious weed treatments would emphasize the retention of continuous healthy riparian vegetation. These actions are expected to have wholly beneficial effects to this PCE.

- **Canyon walls containing crevices, ledges, or caves; and**

Effects:

The proposed actions have no influence on the presence of these features.

- **High percentage of ground litter and woody debris.**

Effects:

Plan Amendment 1: This amendment would allow the Cibola to implement the management of PCEs recommended by the revised owl recovery plan. This would have wholly beneficial effects to this PCE

Plan Amendment 2: This amendment would be precluded by Plan Amendment 1 where managing for MSO habitat.

Puerco Veg Treatment: Implementing mechanical treatments and prescribed fire would decrease surface and canopy fuel loading, as well as ladder fuels in the immediate vicinity of desired trees and groups of trees. This would decrease potential fire-induced mortality in large and/or old trees, as well as in established seedlings and saplings needed to promote uneven-aged structure. Use of prescribed burning, particularly when combined with mechanical thinning, would reduce the potential for damage from wildfires (Fule et al. 2012, Waltz et al. 2014), as well as the costs associated with fire suppression. Lighting techniques to maintain large woody debris would be used.

Puerco Roads: Where roads occur, ground litter and woody debris would be reduced due to road maintenance and traffic. Decommissioning of roads would restore natural conditions to include the presence of ground litter and woody debris long-term.

Puerco Range Improvements: Range improvements would disturb or remove ground litter and woody debris where they occur. These effects are expected to be insignificant.

Puerco Watershed Improvements: Watershed improvements are not expected to have negative effects on this PCE. Upland treatment of gullies would decrease erosion and improve soil conditions which can support retention of ground litter and woody debris.

Cumulative Effects

The definition of cumulative effects under the Endangered Species Act only includes State, private, and non-Federal actions that are reasonably certain to occur within the action area in the future. Therefore, past and present activities within the project area will not be discussed here (i.e., livestock grazing, mining activities, Bluewater restoration project, thinning on private land). No State, private, or non-Federal actions are expected to occur within the project area, and cumulative effects are not expected.

EFFECTS DETERMINATIONS

May affect, likely to adversely affect the Mexican spotted owl.

May affect, likely to adversely affect Mexican spotted owl Critical Habitat.

BIOLOGICAL OPINION CONCLUSIONS

After reviewing the current status of the Mexican spotted owl, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that the project, as proposed, is not likely to jeopardize the continued existence of the Mexican spotted owl nor is it likely to destroy or adversely modify designated critical habitat within the Colorado Plateau EMU or rangewide. The Service also does not expect the effects of the proposed action to appreciably alter the function and intended conservation role of Mexican spotted owl critical habitat, nor is it expected to impede the survival or recovery of the Mexican spotted owl. The Service makes these findings for the following reasons:

1. The Forest Service's Puerco Restoration Project will strive to implement the 2012 MSO

Recovery Plan (Service 2012) and manage for Mexican spotted owl recovery on the Cibola National Forest and National Grasslands.

2. Desired conditions and guidelines in the Puerco Restoration Project recognize the need to reduce the potential for landscape level, stand-replacing fire within both ponderosa pine and mixed conifer forests, which the Mexican spotted owl occupies. These efforts to improve forest condition and sustainability should reduce the risk of high severity fire and, subsequently, reduce the loss of owl habitat.
3. The Service found that some aspects of the proposed action (e.g., vegetation treatments, prescribed fire) have the potential to cause adverse effects (e.g., direct effects via the possibility of vehicle collisions and indirect effects via habitat alteration) to seven PACs in the action area. These seven PACs represent approximately 47% of the MSO PACs, 45% of PAC acres, and 11% of total MSO critical habitat within the CP-EMU in New Mexico (CP-2). Nevertheless, it is anticipated that these impacts will be short-term, and ultimately beneficial in the long-term as forest conditions improve. In addition, the overall acreage impacted is a relatively small percentage of critical habitat unit CP-2 (i.e., approximately 16,910 acres out of 161,577 acres; approximately 10%). Therefore, the proposed action will not affect the role of critical habitat unit CP-2 relative to the conservation of the Mexican spotted owl and to the overall critical habitat designation.

INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined (50 CFR 17.3) to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined (50 CFR 17.3) as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. "Incidental take" is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary, and must be undertaken by the U.S. Forest Service, Cibola National Forest and National Grasslands, so that they become binding conditions of any grant or permit issued to an applicant, as appropriate, for the exemption in section 7(o)(2) to apply. The Forest Service has a continuing duty to regulate the activity covered by this incidental take statement. If the Forest Service (1) fails to assume and implement the terms and conditions or (2) fails to require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Forest Service must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50 CFR §402.14(i)(3)].

Mexican spotted owl

Amount or Extent of Take Anticipated

The Service is reasonably certain that the proposed action will result in incidental take of Mexican spotted owls in the form of harm and harassment. Injury, harm, or death from vehicular collisions is expected to be rare. The majority of incidental take from the proposed action will be in the form of short-term harassment. The Service anticipates that the proposed action will result in incidental take of Mexican spotted owls in the form of harassment due to potential for significant habitat alterations of Mexican spotted owl prey habitat. Owls experiencing short term harassment may fail to successfully rear young in one or more breeding seasons, but will not likely abandon the area because of a short-term disturbance (Delaney et al. 1999); harassment is measured as owls taken associated with a specific number of PACs.

Although the Service anticipates that the proposed action is reasonably certain to result in incidental take of Mexican spotted owls, it is difficult to quantify the number of individual owls taken because: (1) dead or impaired individuals are difficult to find and losses may be masked by seasonal fluctuations in environmental conditions; (2) the status of the species could change over time through immigration, emigration, and loss or creation of habitat; and (3) the species is secretive and we rarely have information regarding the number of owls occupying a PAC and/or their reproductive status. For these reasons, the Service will attribute incidental take at the PAC level. This fits well with our current section 7 consultation policy which provides for incidental take if an activity compromises the integrity of an occupied PAC to an extent that the Service is reasonably certain that incidental take occurred (Service Memorandum, July 1, 1996). Actions outside of PACs will generally not result in incidental take because we are not reasonably certain the owls are nesting and roosting in areas outside of PACs. The Service may modify this determination in cases when areas that may support owls have not been adequately surveyed and we are reasonably certain owls may be present; thus, the Service may assign incidental take in areas where PACs have not been designated.

The Service identified up to seven PACs (6-Mile, Foster, Milk Ranch, Agua Remora, Hogback, Brennan Spring, and Smith Canyon) which may be affected by the Puerco Restoration Project. All seven PACs are anticipated to receive mechanical vegetation treatment and a prescribed burn treatment (Tables 5 and 6). In addition, of those seven PACs, two PACs (6-Mile, Foster) will have some form of range improvement while no PACs should be affected by unauthorized road rehabilitation. However, this work will occur outside the breeding season and habitat will not be modified to the extent that there would be incidental take as a result of this aspect of the proposed action in these PACs.

The Service anticipates that incidental take may occur in the form of harassment in up to two PACs per year due to a single (i.e., one breeding season) or short-term (i.e., one to three breeding season) disturbance or habitat alteration associated with implementation of the proposed action. “Disturbance” is defined as a non-habitat altering action that disrupts or is likely to disrupt owl behavior within the PACs and “habitat alteration” is considered a short-term loss of key habitat component. While the Service does not expect owls associated with two PACs to be taken in the

form of harassment every year, the potential is there in any given year. The disturbance and short-term habitat modification generated by activities associated with the Puerco Restoration Project are likely to interrupt, impede, or disrupt normal behavior patterns to the point that breeding and feeding activities may be impacted over the course of one to three breeding seasons.

Based on the best available information for the Mexican spotted owl, the habitat needs of the species, the description of the proposed action, and information regarding the status of the species within the action area, incidental take is authorized in the following scenarios:

1. Up to one individual PAC, with all associated owls, is harassed for up to three breeding seasons as a result of the proposed action, as determined by monitoring protocol established in coordination with the Service.
2. Up to two PACs, with all associated owls, are harassed in one year as a result of the proposed action, as determined by monitoring protocol established in coordination with the Service.
3. Up to two Mexican spotted owls are taken in the form of harm and/or direct fatality due to vehicular collision on average once every five years, for a fifteen-year period. If this amount of take is exceeded (as stated above), then as provided in 50 CFR Section 402.16, reinitiation of formal consultation would be required. Following the discovery of any reason why the Forest Service may need to treat within a given PAC for greater than three breeding seasons or treat within greater than two PACs within any one year, the Forest Service should coordinate with the Service to determine how to reduce harassment of the owl in an effort to prevent exceedance of take in the form of harassment. Following the discovery of one fatality due to vehicular collision, the Service will re-assess the project with the Forest Service and determine how to reduce fatalities in an effort to prevent exceedance of take in the form of harm.

Effect of Take

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to jeopardize the continued existence of the Mexican spotted owl.

Reasonable and Prudent Measures

Reasonable and prudent measures, and implementing terms and conditions, are designed to minimize the effects of incidental take that might otherwise result from the action. In addition to the Conservation Measures already proposed as part of the project description, the Service believes the following reasonable and prudent measures are necessary and appropriate to minimize impacts of incidental take of the Mexican spotted owl:

1. The Forest Service will conduct all activities in a manner that will minimize adverse effects to the Mexican spotted owl.
2. The Forest Service will conduct all activities in a manner that will minimize modification and loss of Mexican spotted owl habitat.
3. The Forest Service will monitor the impacts of mechanical thinning, prescribed burning, and associated actions to the Mexican spotted owl affected by the Puerco Restoration Project.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the Forest Service and their employees, contractors, or subcontractors must comply with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are nondiscretionary.

The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize incidental take that might otherwise result from the proposed action. If, during the course of the action, this level of incidental take is exceeded, such incidental take would represent new information requiring review of the reasonable and prudent measures provided. The Federal agency must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

The Service establishes the following Terms and Conditions to implement Reasonable and Prudent Measure 1:

1.1. The Forest Service shall avoid activities within 0.25 mile of PACs during the breeding season (March 1 to August 31) that could result in disturbance to nesting owls. If the Forest Service determines through protocol surveys that spotted owls are not nesting the year of the proposed activity or locates a nest and is able to buffer the breeding owls from noise throughout the breeding season, then this restriction would not apply. Other options include documenting topographic buffers in specific PACs or using noise tampering technology to reduce noise impacts.

1.2. The Forest Service, in coordination with the Service, shall develop contingency plans in the event of new PACs being established or PAC boundary modifications due to owl movement or habitat changes. These contingency plans should be developed prior to project implementation in these areas and within three months of discovery of new information. Flexibility shall be built into the project (including task orders) so that as owls move or new sites are located, project activities can be modified to accommodate these situations.

1.3. The Forest Service shall ensure that all contractors associated with thinning and burning activities, transportation of equipment and forest products, research, or restoration activities are briefed on the Mexican spotted owl. Contractors shall be informed about how to avoid harassment of the owl, report sightings and to whom to report, and are informed as to who to contact and what to do if a Mexican spotted owl is incidentally injured, killed, or found injured or dead on the Cibola National Forest and National Grasslands. If an owl fatality is discovered, the Forest Service shall contact the New Mexico Ecological Services Field Office (New Mexico ESFO) or the Service's Mexican spotted owl lead as soon as possible.

The Service establishes the following Terms and Conditions to implement Reasonable and Prudent Measure 2:

2.1. The Forest Service shall coordinate management activities within PACs and restricted/recovery habitat in order to reduce effects to habitat from multiple entries that can disturb owls and result in adverse effects to habitat.

2.2. The Forest Service shall meet annually with the New Mexico ESFO to discuss the upcoming year's thinning and burning plans in Mexican spotted owl habitat and review the past year's thinning and burning activities in owl habitats.

The Service establishes the following Terms and Conditions to implement Reasonable and Prudent Measure 3:

3.1. The Forest Service shall monitor the effects of mechanical thinning and prescribed burning on owl occupancy and reproduction, and key habitat components (as defined in the Revised Mexican spotted owl Recovery Plan, table C.2) within an appropriate number of treatment and reference PACs, as determined in coordination with the New Mexico ESFO. Owl occupancy and reproductive data shall be collected for at least two years prior to treatment and two years post-treatment. Vegetation data should be collected pretreatment and at defined intervals post-treatment. The specific plan development, selection of PACs, and monitoring framework shall be developed in coordination with the New Mexico ESFO and Forest Service District Staff to ensure coordination with other projects and monitoring efforts within 90 days of the publishing of this biological opinion. The monitoring plan shall be designed and implemented to evaluate the effects of thinning and prescribed fire on owl occupancy and reproduction, and retention of or movement toward desired habitat conditions within PACs, as defined in the 2012 MSO Recovery Plan (Service 2012).

3.2. The Forest Service shall monitor the impacts of incidental take resulting from implementation of the proposed action and report these findings to the New Mexico ESFO. Incidental take monitoring shall include information such as when the project was implemented, whether the project was implemented as proposed and analyzed in this biological opinion (including conservation measures and best management practices), breeding season(s) over which the project occurred, relevant Mexican spotted owl survey information, and any other pertinent information about the project's effects on the species.

3.2. Annual reports will describe actions taken under this proposed action and impacts to the owl and its critical habitat. The annual report shall be sent to the New Mexico ESFO and the Service's Mexican spotted owl species lead by March 1 of each year following implementation of the proposed action (i.e., activities performed during 2019 will be included in the March 1, 2020, report).

Zuni Flea Bane

No Action

Effects are expected for Zuni Flea Bane under the no action alternative. No vegetation treatments could mean, trees with down woody debris can lead to increased risk of a stand replacing fire. This could wipe out the species if the fire happen where the species is located. This could reduce the population numbers, which would mean a reduction in population recovery.

Effects to this species are expected because decommission of 200 miles of unauthorized roads would not occur and could lead motorists to travel illegally in areas where the Zuni Fleabane may occur, which could have a negative effect. User-created routes can be expected to increase erosion, which can have impacts to surrounding habitats far greater than just the trail surface itself (down-cutting and side channeling, as a result of heavy rains). New user-created routes would receive increase use from all types of recreation users over time adding to the current density of routes by an as yet unknown amount.

Water is very important to all species, by not doing improvements to riparian areas, streams, and springs may affect Zuni flea bane in the long term. These areas can dry up over time if not monitored and managed properly. If the water goes away, the plants in this area may decline, which could reduce the overall population of the species.

Alternative B

Direct Effects

Plan Amendment 1

Implementation of Plan Amendment 1 would not directly affect the Zuni fleabane. Prescribed treatments associated with habitat restoration or enhancement for the Mexican spotted owl would not be conducted in occupied Zuni fleabane habitat. A spatial avoidance buffer of at least 200 feet would be applied to treatments near known fleabane populations to avoid take of individuals. If conflicts arise between habitat work for MSO and protection of Zuni fleabane, the USFWS would be consulted.

Plan Amendment 2

Implementation of Plan Amendment 2 would not directly affect the Zuni fleabane. Prescribed vegetation treatments would not be conducted in occupied Zuni fleabane habitat. A spatial avoidance buffer of at least 200 feet would be applied to treatments near known fleabane populations to avoid take of individuals.

Puerco: Vegetation Treatments

Proposed vegetation treatments are not expected to directly affect the Zuni fleabane. Prescribed treatments would not be conducted in occupied Zuni fleabane habitat. A spatial avoidance buffer of at least 200 feet would be applied to treatments near known fleabane populations to avoid take of individuals. Thinning activities near known populations would be conducted in a manner which avoids falling trees into occupied habitat. The effects of fire on this species have not been evaluated, and it is therefore reasonable to avoid introducing fire into known populations. Therefore, prescribed fire containment lines would be planned and implemented to prevent fire from entering occupied habitat. Currently, additional surveys are ongoing within the action area. A 200 foot buffer would be applied to any new populations identified in future surveys to avoid adverse impacts to the fleabane.

Puerco: Roads

Both the Type and Six-Mile localities occur within close proximity to roads. Route 547 (FS Maintenance level 2) is an authorized and primary haul route that roughly coincides with the contour of Six-Mile Canyon and is within ~ ½ mile of the Six-Mile site and barbed-wire enclosure. The entirety of the Type site is located within 50 ft of NM State Route 400, which is a

paved highway. Both roads are utilized by the public and would be used as access and haul routes for the Puerco project. The use and maintenance of these roads may cause injury or mortality of individuals if not avoided during project implementation. These localities would be mapped and marked for avoidance during implementation. They would also be excluded as staging areas for vehicles or heavy equipment. Herbicide use on road corridors within known populations would not be conducted without further consultation with the USFWS. Any drainage improvement on these roads would be located outside of occupied habitat if possible. If not, additional consultation under Section 7 of the ESA would be initiated.

Puerco: Range Improvements

Two range improvements are within close proximity of the Six-Mile site, where 75 plants were identified in 2014. An erosion control project and a new storage tank and drinker off of a distribution pipeline are proposed within half a mile of the population and fenced enclosure. The area to be avoided during implementation would be mapped, marked, and communicated to personnel on the ground. No construction, vehicle/equipment staging, parking, driving, or other surface disturbing activities would occur in the occupied area. If this area is effectively avoided during project implementation, no direct effects to this population would occur.

Puerco: Watershed Improvements

No watershed improvements are proposed within or near occupied Zuni fleabane habitat. Therefore, no direct effects to the Zuni fleabane are expected from watershed improvements.

Indirect Effects

Plan Amendment 1

Implementation of Plan Amendment 1 may indirectly affect the Zuni fleabane. Prescribed treatments associated with habitat restoration or enhancement for the Mexican spotted owl would be conducted within the Chinle formation, which may include suitable habitat for the Zuni fleabane. Proposed habitat modifications would be aimed at reducing hazardous fuels and increasing resiliency of forested habitat to catastrophic wildfire and other large scale stochastic events, which can be expected to benefit the Zuni fleabane in the long term. At such time when Zuni fleabane habitat suitability mapping occurs, owl habitat restoration projects would be planned to avoid areas with high potential for occurrence of the fleabane or to enhance required habitat components for the species.

Plan Amendment 2

Implementation of Plan Amendment 2 may indirectly affect the Zuni fleabane. Prescribed treatments associated with management of uneven-aged stand conditions and the presence of variable interspaces mainly in ponderosa pine ecosystems would be tailored for northern goshawk management. There is some overlap between ponderosa pine habitats and the Chinle formation. However, it is unknown to what extent the mapped Chinle formation represents actual suitable habitat for the plant. Nonetheless, implementation would result in short term effects to soil microclimates and vegetative cover that could influence habitat suitability for the Zuni fleabane. At such time when Zuni fleabane habitat suitability mapping occurs, goshawk habitat restoration projects would be planned thereafter to avoid areas with high potential for occurrence of the fleabane or to enhance required habitat components for the species.

Plan Amendment 2 does not have effects on a site-specific level. Rather, its effects are broad and beneficial at the planning level, which does not allow for quantification of project level effects.

Furthermore, management for the Zuni fleabane would be prioritized over management for northern goshawks in habitats important to the fleabane as long as the plant remains listed and potentially thereafter, and goshawk management would not be implemented where it would lead to adverse impacts to the fleabane. Further inventory of the Zuni Mountains for the Zuni fleabane is continuing in summer of 2019. Treatments proposed in newly identified suitable or occupied habitats would be adjusted to conserve the species.

Puerco: Vegetation Treatments

Suitable Zuni fleabane habitat outside of occupied habitat has not been delineated or mapped. However, extensive field surveys of Federal land in the Zuni Mountains have occurred (Fletcher 1987, Sabo 1982, Roth & Sivinski 2014). Vegetation treatments would not occur within occupied habitats that have been identified and mapped. It is possible for vegetation treatments to occur in other suitable habitats. In that case, short term effects would include alteration of soil microsite conditions and reduced herbaceous and canopy cover. The long term benefits of Puerco vegetation treatments to ultimately increase ecosystem resiliency to catastrophic wildfire and other stochastic events would benefit potential fleabane habitat by.

Puerco: Roads

Both populations of Zuni fleabane in the project area are within ~½ mile of well-traveled roads. Puerco project implementation would increase traffic on these roads and likely lead to increased maintenance. If maintenance activities involve vehicles using road shoulders for parking, access, or equipment staging, soil compaction would occur and the risk of introducing or increasing the spread of invasive species would rise. To avoid these impacts to known suitable Zuni fleabane habitat, areas of road within close proximity to known populations would be marked and mapped to avoid trampling and surface disturbance of habitat. Furthermore, if increased travel on roads adjacent to fleabane populations leads to erosion, degradation of suitable habitat may occur due to incision and/or sedimentation. However, best management practices would be applied to road maintenance for protection of habitat.

Puerco: Range Improvements

Two range improvements are within close proximity of the Six-Mile site. An erosion control project and a new storage tank and drinker off of a distribution pipeline are proposed within half a mile of the population and fenced enclosure (Figure 18). The erosion control project is located in a gully adjacent to the fenced portion of the Six-Mile site. This project would reduce erosion in the general vicinity and provide long term protection for the occupied habitat. The site would be marked and mapped to avoid habitat disturbance during project implementation. The proposed storage tank and drinker would cause soil and vegetation disturbance during installation. Again, for mitigation purposes, the nearby population site would be marked and mapped to avoid during implementation. Long term effects of a cattle trough in this area include increased use by livestock, which is generally associated with higher levels of soil compaction and grazing/browsing of vegetation. If the enclosure fence is not maintained, increased livestock use of this area could lead to habitat disturbance.

Puerco: Watershed Improvements

There are no watershed improvements proposed within the general vicinity of the occupied habitat. Erosion control projects that occur in other areas would result in watershed benefits and therefore benefit potential/suitable Zuni fleabane habitat.

CUMULATIVE EFFECTS

The definition of cumulative effects under the Endangered Species Act only includes State, private, and non-Federal actions that are reasonably certain to occur within the action area in the future. Therefore, past and present activities within the project area will not be discussed here (i.e., livestock grazing, mining activities, Bluewater restoration project, thinning on private land). No State, private, or non-Federal actions are expected to occur within the project area, and cumulative effects are not expected.

EFFECTS DETERMINATION

May affect, not likely to adversely affect the Zuni bluehead sucker.

Zuni Bluehead Sucker & Zuni Bluehead Sucker Critical Habitat

No Action

Effects are expected for the No Action alternative. Without vegetation treatments to the area, thick trees in the area along with down woody debris can lead to increased risk of a stand replacing fire. This could shrink existing vegetation around the Agua Remora spring area where the sucker occupies. This could increase sun exposure to the spring and intermittent stream which could dry out the area eliminating habitat for the sucker. If a stand replacing fire occurs up stream could also have detrimental effects. Sediment and ash can flow downstream, especially during high flow events, which can ruin the fish habitat. Both of these events can wipe out the population within the National Forest boundary along with the populations off of the forest to the southwest.

Water is very important to all species, by not doing improvements to riparian areas, streams, and springs may affect Zuni bluehead sucker in the long term. These areas can dry up over time if not monitored and managed properly. If the water goes away, the species may decline, which could reduce the overall population of the species.

Alternative B

Direct Effects

Plan Amendment 1

No direct effects are expected from implementation of Amendment 1. It is a planning-level action, and therefore does not have site-specific effects.

Plan Amendment 2

No direct effects are expected from implementation of Amendment 2. It is a planning-level action, and therefore does not have site-specific effects.

Puerco: Vegetation Treatments

The only known occurrence of the Zuni bluehead sucker within the project area is in pools fed by the Agua Remora spring. The Best Management Practices for this project include the use of Management Zones to protect water resources and associated features. For perennial waters, the following mitigations would apply within a management zone of 300 ft from the edge of the

active floodplain: 1) No tree removal except as approved or designated by the watershed and wildlife specialists to benefit stream functions, 2) Large wood placement allowed for restoration as approved or determined by the watershed and wildlife specialists, 3) No mechanized or motorized activities permitted. No planned vegetation treatments would occur within the occupied habitat, and all areas to be excluded from treatment would be clearly marked and mapped for avoidance during implementation. If these mitigation measures are followed, proposed vegetation treatments are not expected to have direct effects to the Zuni bluehead sucker within the project area.

Puerco: Roads

A proposed haul route (Route ID: 154BD) occurs within approximately 200 feet of the pools occupied by Zuni bluehead sucker. This is an existing Forest System road in ML 2 status. During project implementation, this road would be improved and maintained to sustain increased use by timber hauling trucks. The road crosses the Agua Remora immediately downstream of the occupied habitat and bisects Critical Habitat through which the fish have been observed to disperse during high flow periods. Improvement of this road would involve extensive engineering to bring it to appropriate timber-hauling standards, which would include a crossing in an area critical to the fish. It is highly likely that these activities would directly affect occupied sucker habitat and could result in mortality of individuals and possibly an entire population from heavy equipment use instream and resulting sedimentation. This is the only population that occurs on FS land. To avoid direct adverse impacts to the species, this road must not be included in the list of roads approved for hauling. The road is currently not being used due to access issues and will be recommended for closure.

Puerco: Range Improvements

No new range improvement projects are proposed within or near occupied Zuni bluehead sucker habitat. Therefore, they are not expected to directly affect the species.

Puerco: Watershed Improvements

The Agua Remora riparian area underwent a Proper Functioning Condition assessment and was found to be functioning-at-risk. This means it is in limited functional condition, and an existing hydrologic, vegetative, or geomorphic attribute makes it susceptible to impairment. The area is likely impaired or unsatisfactory due to lack of ground cover and bare ground. Projects that may be implemented to improve its condition include fencing to reduce or exclude use of the water and soil/vegetation disturbance by livestock and rehabilitation/closure of roads in the area. This area has been monitored continually for water quality and water level. This practice would continue to allow for proper adaptive management to bring the riparian area to properly functioning condition and to eventually reach an advanced ecological status. There would be no direct impacts of installing or maintaining fences because they would not be installed directly in occupied pools. They would instead be installed in the surrounding area. No direct effects would occur from road rehabilitation or closures because these activities would not occur in occupied pools. If water monitoring utilizes instream devices, there would be temporary disturbance to occupied pools due to the placement/installation of equipment, but these effects are expected to be insignificant. In general, watershed improvements throughout the Agua Remora watershed are expected to improve conditions for the sucker.

Indirect Effects

Plan Amendment 1

Management of forested habitat for recovery of the Mexican spotted owl has the potential to indirectly affect the Zuni bluehead sucker. By improving the quality of riparian habitats throughout the Agua Remora drainage, the implications of Amendment 1 have the potential to improve vegetative cover and water quality in sucker habitat and potentially increase water quantity, which would lead to increased opportunity for dispersal and reproduction of the sucker. The goal of reducing the threat of catastrophic wildfire would benefit sucker habitat by decreasing the risk of resulting surface runoff/flooding, soil erosion, and general habitat degradation.

Plan Amendment 2

Management of forested habitat for northern goshawk is not expected to adversely affect the Zuni bluehead sucker. Managing for increased interspaces in ponderosa pine habitats has the potential to increase herbaceous cover in open patches as well as reduce the risk of stand-replacing wildfires and resulting erosion and run-off which have the potential to erode drainages and degrade riparian habitats and waterways. Overall watershed improvement is expected.

Puerco: Vegetation Treatments

The proposed vegetation treatments would not occur directly in occupied habitat, but they have the potential to affect conditions upland of occupied habitat. Prescribed thinning and burning would temporarily reduce or remove surface vegetation, potentially leading to increased amounts of surface run-off and sedimentation in waterways during flow events. However, these activities would not occur within 300 feet of occupied or potential sucker habitat (i.e., the Agua Remora), and therefore a vegetative buffer would be maintained to mitigate these effects to sucker habitat. The prescribed buffers are expected to reduce the overland component of sediment. Other practices, such as water bars, restrictions on motorized use, and location of hand piles are expected to further reduce the input of sediment to those features. Concentrated surface runoff which has the potential to breach the prescribed buffers would be reduced by these practices.

The water quality components most likely to be affected by the proposed activities are sediment, and dissolved nutrients such as nitrogen. Ecosystems accumulate and cycle large quantities of nutrients. Fire and loss of vegetation can disrupt this cycle and cause nutrient leaching, volatilization, and transformation (Elliot et al. 2010). Wildfires release more nitrogen into surface waters than prescribed fire (Stednick 2000). If vegetation is quickly re-established, nutrient exports are short-lived and usually do not represent a threat to water quality (Elliot et al. 2010). The prescribed Management Zone of 300 feet was chosen because several sources including modeling based on Forest-specific parameters (WEPP) indicate that 100 meters is generally effective in controlling sediment (Belt et al. 1992). Water quality in areas important to the sucker is not expected to be negatively affected by vegetation treatments.

Sedimentation as a result of logging has been identified as a threat to the species (78 FR 5369, January 25, 2013), and commercial removal has been proposed within this watershed. Habitat requirements for the sucker include stream reaches with clean, perennial water, flowering over hard substrate, such as bedrock. The sucker is rare and absent where substrates are predominantly sand and silt. To prevent these effects, reduced treatment levels have been proposed within 1300 feet of occupied habitat (outside of the 300 foot Management Zone buffer): low amounts of thinning, no mastication, and low to moderate levels of prescribed fire.

Other reduced treatments are proposed in the Agua Remora in unoccupied areas, which include low amounts of thinning using a lop-and-scatter method, no mastication, and no burning. These treatments are expected to increase habitat resiliency to wildfire and improve overall watershed health, which would benefit sucker habitat long-term.

Puerco: Roads

A proposed haul route (Route ID: 154BD) occurs within approximately 200 feet of the pools occupied by Zuni bluehead sucker within Agua Remora. This is an existing Forest System road in ML 2 status. During project implementation, this road would need to be improved and maintained to sustain increased use by timber hauling trucks. The road crosses the Agua Remora immediately downstream of the occupied habitat and bisects Critical Habitat through which the fish have been observed to disperse during high flow periods. Improvement of this road would involve extensive engineering to bring it to appropriate timber-hauling standards, which would include a crossing in an area critical to the fish. This action would cause disturbance directly in the stream, leading to increased sedimentation and reduction of algal foraging habitat. To avoid adverse impacts to the habitat, this road would not be included in the list of roads approved for hauling. Other routes proposed for hauling traverse or are in close proximity of Critical Habitat. Alternate routes would be sought for these areas to avoid disturbance within waterways.

Puerco: Range Improvements

No new range improvements have been proposed in or near suitable Zuni bluehead sucker habitat. Therefore, no indirect effects are expected from these actions.

Puerco: Watershed Improvements

The Agua Remora riparian area underwent a Proper Functioning Condition assessment and was found to be functioning-at-risk. This means it is in limited functional condition, and an existing hydrologic, vegetative, or geomorphic attribute makes it susceptible to impairment. The area is likely impaired or unsatisfactory due to lack of ground cover and bare ground. Projects that may be implemented to improve its condition include fencing to reduce or exclude use of the water and soil/vegetation disturbance by livestock and rehabilitation/closure of roads in the area. This area has been monitored in the past for water quality and water level. This practice would continue to allow for proper adaptive management to bring the riparian area to properly functioning condition and to eventually reach an advanced ecological status. The indirect impacts of installing or maintaining fences would include short-term and insignificant levels of surface disturbance when installing fence posts, corner braces, and wire in the area surrounding the occupied pools. Road rehabilitation or closures would help restore riparian habitats and watershed condition to reduce run-off from roads and resulting erosion and sediment deposition in stream channels. If water monitoring utilizes instream devices (e.g., sondes), there would be temporary disturbance to waterways/pools due to the placement/installation of equipment, but these effects are expected to be insignificant. In general, watershed improvements throughout the Agua Remora watershed are expected to improve conditions for the Zuni bluehead sucker.

EFFECTS TO ZUNI BLUEHEAD SUCKER CRITICAL HABITAT

Primary constituent elements are the physical and biological features that are essential to conservation of the species and that may require special management considerations or protection. For the Zuni bluehead sucker, these include those physical and biological features

that support reproduction, foraging, cover, and dispersal. They are listed below (USFWS 2016) along with effects from the proposed action.

1. A RIVERINE SYSTEM WITH HABITAT TO SUPPORT ALL LIFE STAGES OF ZUNI BLUEHEAD SUCKER (EGG, LARVAL, JUVENILE, AND ADULT), WHICH INCLUDES:

- **Dynamic flows that allow for periodic changes in channel morphology and adequate river functions, such as channel reshaping and delivery of coarse sediments.**

Effects:

Plan Amendment 1: Plan Amendment 1 is not expected to significantly or negatively alter this constituent element. Management of forested habitat for the Mexican spotted owl would support restoration of riparian habitats and proper functioning rivers and streams.

Plan Amendment 2: Plan Amendment 2 is not expected to significantly or negatively alter this constituent element. Management of forest interspaces for the restoration of northern goshawk habitat would benefit riverine systems within the watershed by increasing wildfire resiliency.

Puerco Veg Treatments: Vegetation treatments are unlikely to produce significant alteration of flows within Critical Habitat due to the implementation of a 300 foot buffer around perennial waters within which treatments using mechanized or motorized equipment would not occur. This buffer is adequate to dissipate energy from upland treatment sites and buffer the riverine system from increased sediment deposition possible from prescribed fire and reduced vegetative cover in the short term.

Puerco Roads: Flows would potentially be altered if roads are to be improved crossing Critical Habitat. There are no perennial streams mapped within the project area. There are areas of perennial waters associated with springs and in one case an uncapped artesian well. Roads would not be constructed within perennial waters. However, existing roads that cross drainages would follow best management practices to preserve channel morphology and reduce sediment discharge during flow events. The rehabilitation and closure of some roads would potentially benefit this constituent element by reducing fine sediment contributed by roads.

Puerco Range Improvements: No range improvements are proposed within or near Critical Habitat, therefore no effects are expected.

Puerco Watershed Improvements: Watershed improvements such as spring restoration would occur at one site along Critical Habitat (Agua Remora spring). The primary method of restoration would be installation and maintenance of fences to exclude livestock from pools that contain suitable and occupied habitat for the sucker. The fences would allow vegetative recovery and increased water retention in and around pools. This recovery would reduce fine sediment deposition and allow channel morphology to respond naturally to dynamic flows with a lower risk of channel incision.

- **Stream courses with perennial flows, or areas that may be periodically dewatered but serve as connective corridors between occupied or seasonally occupied habitat and through which the species may move when the habitat is wetted;**

Effects:

Plan Amendment 1: Plan Amendment 1 is not expected to significantly or negatively alter this constituent element. Management of forested habitat for the Mexican spotted owl would support restoration of riparian habitats and proper functioning rivers and streams.

Plan Amendment 2: Plan Amendment 2 is not expected to significantly or negatively alter this constituent element. Management of forest interspaces for the restoration of northern goshawk habitat would benefit riverine systems within the watershed by increasing wildfire resiliency.

Puerco Veg Treatments: This constituent element exists within the project area. Parts of the Agua Remora channel may be characterized as perennial, and some are intermittent. During high flow events or periods, dewatered reaches serve as connective corridors between occupied habitats, and the species has been thought to disperse through these areas during these wetted periods. The thinning and prescribed fire treatments proposed are not expected to significantly alter these characteristics due to the implementation of a Management Zone buffer of 300 feet. By reducing the risk of stand-replacing wildfire, the treatments would have long-term beneficial effects to this constituent element.

Puerco Roads: Roads going through the stream/drainage channel within Critical Habitat have the potential to negatively affect this constituent element. The implementation of engineered crossings would involve earth work with heavy machinery and more than likely installation of instream structures and culverts resulting in disturbance to the channel and surrounding soils/vegetation. For this reason, roads crossing Critical Habitat are not being recommended for use as timber hauling routes, and alternative routes will be identified to avoid fragmentation of contiguous habitat and habitats that may be used for dispersal during high flow periods. However, in some cases, stream/drainage road crossings may be necessary. In the event road crossings are used or improved, best management practices would be applied to best preserve the characteristics of this constituent element. Design features would be approved by the wildlife biologist and watershed specialist.

Puerco Range Improvements: No range improvements are proposed within or near Critical Habitat, therefore no effects are expected.

Puerco Watershed Improvements: The only watershed improvements proposed in or near Critical Habitat include stream restoration in Agua Remora by fencing and monitoring. Fencing the spring to exclude livestock would lead to recovery of soils and recruitment of vegetation, which have the potential to improve water retention. This effect could lead to re-watering or more frequent re-watering of connective corridors and improved dispersal ability of the sucker.

- **Stream microhabitat types including runs, riffles, and pools with substrate ranging from gravel, cobble, and bedrock substrates with low or moderate amounts of fine sediment and substrate embeddedness**

Effects:

Plan Amendment 1: Plan Amendment 1 is not expected to significantly or negatively alter this constituent element. Management of forested habitat for the Mexican spotted owl would support restoration of riparian habitats and proper functioning rivers and streams.

Plan Amendment 2: Plan Amendment 2 is not expected to significantly or negatively alter this constituent element. Management of forest interspaces for the restoration of northern goshawk habitat would benefit riverine systems within the watershed by increasing wildfire resiliency.

Puerco Veg Treatments: Within the project area, the Agua Remora watershed supports medium to small blocks of contiguous habitat, and the only occupied area consists of small relatively shallow pools. Some high-quality aquatic habitat is available, but stream channel conditions show signs of degradation. Moderate to high amounts of fine sediment are present. The proposed vegetation treatments are unlikely to worsen the present condition of these pools due to a 300

foot Management Zone buffer that would be applied, which leaves adequate habitat space to ensure significant sediment deposition post-treatment does not occur. These treatments are intended to improve overall watershed condition.

Puerco Roads: Flows would potentially be altered if roads are to be improved crossing Critical Habitat. However, haul routes crossing waterways, perennial waters, and riparian areas would be avoided to eliminate this impact. The rehabilitation and closure of some roads would potentially benefit this constituent element by reducing fine sediment contributed by roads and increased road use.

Puerco Range Improvements: No range improvements are proposed within or near Critical Habitat, therefore no effects are expected.

Puerco Watershed Improvements: Watershed improvements such as spring restoration would occur at one site along Critical Habitat (Agua Remora spring). The primary method of restoration would be installation and maintenance of fences to exclude livestock from pools that contain suitable and occupied habitat for the sucker. The fences would allow vegetative recovery and increased water retention in and around pools, which would improve microsite conditions. This recovery would reduce fine sediment deposition and allow channel morphology to respond naturally to dynamic flows with a lower risk of channel incision.

- **Streams with depths generally less than 2 m (3.3 ft), and with slow to swift flow velocities less than 35 cm/sec (1.1 ft/sec)**

Effects:

Plan Amendment 1: Plan Amendment 1 is not expected to significantly or negatively alter this constituent element. Management of forested habitat for the Mexican spotted owl would support restoration of riparian habitats and proper functioning rivers and streams.

Plan Amendment 2: Plan Amendment 2 is not expected to significantly or negatively alter this constituent element. Management of forest interspaces for the restoration of northern goshawk habitat would benefit riverine systems within the watershed by increasing wildfire resiliency.

Puerco Veg Treatments: This constituent element exists within the project area. Known occupied pools are not more than 2 meters deep and generally have laminar to low turbulent flows. There is a possibility that prescribed burning in upland areas may temporarily lead to increased surface run-off during precipitation events or winter snowmelt leading to higher flow velocities. This effect is unlikely due to the application of a 300 foot Management Zone buffer and the low levels of precipitation and winter snowpack typical of this area.

Puerco Roads: Proposed road improvements are not expected to affect stream/pool depth or flow velocities. Haul routes would be avoided in Critical Habitat, and alternate routes would be used when possible. If routes must be constructed in or near Critical Habitat, perennial waters and pools would be avoided completely and crossings would be designed for proper drainage so as not to impede the flow of any existing channel. Best management practices would be followed for engineered crossings within waterways.

Puerco Range Improvements: No range improvements are proposed within or near Critical Habitat, therefore no effects are expected.

Puerco Watershed Improvements: If fencing projects lead to increased water retention in streams and/or pools, they have the potential to increase stream/pool depth, but they are unlikely to significantly affect flow velocities.

- **Clear, cool water with low turbidity and temperatures in the general range of 9.0 to 28.0°C (48.2 to 82.4°F)**

Effects:

Plan Amendment 1: Plan Amendment 1 is not expected to significantly or negatively alter this constituent element. Management of forested habitat for the Mexican spotted owl would support restoration of riparian habitats and proper functioning rivers and streams.

Plan Amendment 2: Plan Amendment 2 is not expected to significantly or negatively alter this constituent element. Management of forest interspaces for the restoration of northern goshawk habitat would benefit riverine systems within the watershed by increasing wildfire resiliency.

Puerco Veg Treatments: Proposed vegetation treatments are not expected to significantly affect water quality or temperature due to implementation of a 300 foot Management Zone buffer within which motorized and mechanized equipment would not be used to thin vegetation. This buffer is adequate to dissipate run-off and protect waters from increased sedimentation.

Prescribed fire has the potential to release additional nutrients such as nitrogen. However, a significant contribution of nitrogen or other nutrients to the riparian system and stream is not expected. These effects would be mitigated by the implementation of low to moderate levels of prescribed fire in the upland and the 300 foot Management Zone buffer around perennial waters and riparian areas.

Puerco Roads: Proposed road improvements may affect water quality, temperature, or turbidity if they occur within Critical Habitat. Haul routes would be avoided in Critical Habitat, and alternate routes would be used when possible. If routes must be constructed in or near Critical Habitat, perennial waters and pools would be avoided completely and crossings would be designed for proper drainage so as not to impede the flow of any existing channel. Best management practices would be followed for engineered crossings within waterways.

Puerco Range Improvements: No range improvements are proposed within or near Critical Habitat, therefore no effects are expected.

Puerco Watershed Improvements: Fencing projects can be expected to allow recovery of soils and riparian vegetation which could improve conditions for high water quality and cooler temperatures. Turbidity may be reduced over time as vegetation becomes more decadent and capable of dissipating stream energy.

- **No harmful levels of pollutants**

Effects:

Plan Amendment 1: Plan Amendment 1 is not expected to significantly or negatively alter this constituent element. Management of forested habitat for the Mexican spotted owl would support restoration of riparian habitats and proper functioning rivers and streams.

Plan Amendment 2: Plan Amendment 2 is not expected to significantly or negatively alter this constituent element. Management of forest interspaces for the restoration of northern goshawk habitat would benefit riverine systems within the watershed by increasing wildfire resiliency.

Puerco Veg Treatments: Vegetation treatments are not expected to unlock any major sources of harmful pollutants. The application of low to moderate intensity prescribed fire would decrease the likelihood of stand replacing wildfires which have the potential to release significant amounts of organic carbon and other harmful pollutants (e.g., mercury) into waterways. The proposed levels of prescribed fire also have the potential to release beneficial nutrients (e.g., nitrogen, phosphorus) at levels that may improve fish habitat.

Puerco Roads: Currently, some forest roads either cross the Agua Remora through Critical Habitat or they come within very close proximity. Road traffic is a possible source of pollutants. However, these roads are not being recommended for use as timber haul routes, and therefore no negative effects to this constituent element are expected. Rehabilitation and closure of these roads would benefit habitat for the sucker by reducing the threat of harmful pollutants.

Puerco Range Improvements: No range improvements are proposed within or near Critical Habitat, therefore no effects are expected.

Puerco Watershed Improvements: Fencing of riparian areas is not expected to introduce or increase levels of harmful pollutants within Critical Habitat for the sucker. Rather, it is expected to aid in recovery of riparian systems, which is expected to increase water quality over time. Monitoring devices would be instrumental in measuring water quality metrics, and would therefore benefit this constituent element.

- **Adequate riparian shading to reduce water temperatures when ambient temperatures are high and provide protective cover from predators.**

Effects:

Plan Amendment 1: Plan Amendment 1 is not expected to significantly or negatively alter this constituent element. Management of forested habitat for the Mexican spotted owl would support restoration of riparian habitats and proper functioning rivers and streams.

Plan Amendment 2: Plan Amendment 2 is not expected to significantly or negatively alter this constituent element. Management of forest interspaces for the restoration of northern goshawk habitat would benefit riverine systems within the watershed by increasing wildfire resiliency.

Puerco Veg Treatments: Vegetation treatments would apply a 300 foot buffer to riparian areas to prevent degradation of riparian vegetation and functioning. Thinning within 300 feet may be allowed, but only by hand and only if it benefits riparian characteristics and is approved by the wildlife biologist and watershed specialists. By managing riparian areas for increased health and vigor, over time riparian shading would be restored and/or maintained.

Puerco Roads: No proposed road improvements would occur within riparian areas, and therefore no effects are expected to this critical element from these actions.

Puerco Range Improvements: No range improvements are proposed within or near Critical Habitat, therefore no effects are expected.

Puerco Watershed Improvements: Fencing of riparian areas would allow rest and recovery of vegetation and soils from livestock grazing, which would increase riparian shading, have positive effects on water temperatures, and provide increased cover from predators.

2. AN ABUNDANT AQUATIC INSECT FOOD BASE CONSISTING OF FINE PARTICULATE ORGANIC MATERIAL, FILAMENTOUS ALGAE, MIDGE LARVAE, CADDISFLY LARVAE, MAYFLY LARVAE, FLATWORMS, AND SMALL TERRESTRIAL INSECTS.

Effects:

Plan Amendment 1: Plan Amendment 1 is not expected to significantly or negatively alter this constituent element. Management of forested habitat for the Mexican spotted owl would support restoration of riparian habitats and proper functioning rivers and streams.

Plan Amendment 2: Plan Amendment 2 is not expected to significantly or negatively alter this constituent element. Management of forest interspaces for the restoration of northern goshawk habitat would benefit riverine systems within the watershed by increasing wildfire resiliency.

Puerco Veg Treatments: The 300 acre implementation buffer should be adequate to dissipate energy and sediment discharge from upland area prescribed thinning and fire treatments. Water quality would not be negatively affected due to the low likelihood of increased sedimentation in perennial waters. These actions are not expected to negatively affect aquatic insect abundance.

Puerco Roads: Currently, some forest roads either cross the Agua Remora through Critical Habitat or they come within very close proximity. Road traffic is a possible source of pollutants. However, these roads are not being recommended for use as timber haul routes, and therefore no negative effects to this constituent element are expected. Rehabilitation and closure of these roads would benefit prey habitat for the sucker by reducing the threat of harmful pollutants.

Puerco Range Improvements: No range improvements are proposed within or near Critical Habitat, therefore no effects are expected.

Puerco Watershed Improvements: Fencing of riparian areas would allow rest and recovery of riparian habitats and perennial waters from livestock grazing, which would protect macroinvertebrate communities and improve water quality.

3. **AREAS DEVOID OF NONNATIVE AQUATIC SPECIES OR AREAS THAT ARE MAINTAINED TO KEEP NONNATIVE SPECIES AT A LEVEL THAT ALLOWS THE ZUNI BLUEHEAD SUCKER TO CONTINUE TO SURVIVE AND REPRODUCE. DEVELOPED AREAS SUCH AS LANDS COVERED BY BRIDGES, DOCKS, AQUEDUCTS, AND OTHER STRUCTURES ARE EXCLUDED BECAUSE SUCH LANDS LACK PHYSICAL OR BIOLOGICAL FEATURES FOR THE ZUNI BLUEHEAD SUCKER. THESE AREAS ARE EXCLUDED BY TEXT IN THE PROPOSED RULE (78 FR 5357).**

Effects:

Plan Amendment 1: Plan Amendment 1 is not expected to significantly or negatively alter this constituent element. Management of forested habitat for the Mexican spotted owl would support restoration of riparian habitats and proper functioning rivers and streams.

Plan Amendment 2: Plan Amendment 2 is not expected to significantly or negatively alter this constituent element. Management of forest interspaces for the restoration of northern goshawk habitat would benefit riverine systems within the watershed by increasing wildfire resiliency.

Puerco Veg Treatments: Vegetation treatments are not expected to introduce or increase the abundance of non-native aquatic species.

Puerco Roads: Proposed road improvements are not a source of non-native aquatic species. Vehicles or equipment used within the project area would follow standard invasive species prevention procedures, and no watercraft would be used.

Puerco Range Improvements: No range improvements are proposed within or near Critical Habitat, therefore no effects are expected.

Puerco Watershed Improvements: Fencing riparian areas, pools, or perennial waters is not expected to introduce non-native aquatic species.

CUMULATIVE EFFECTS

The definition of cumulative effects under the Endangered Species Act only includes State, private, and non-Federal actions that are reasonably certain to occur within the action area in the

future. Therefore, past and present activities within the project area will not be discussed here (i.e., livestock grazing, mining activities, Bluewater restoration project, thinning on private land). No State, private, or non-Federal actions are expected to occur within the project area, and cumulative effects are not expected.

EFFECTS DETERMINATIONS

May affect, not likely to adversely affect the Zuni bluehead sucker.

May affect, not likely to adversely affect Zuni bluehead sucker Critical Habitat.

Southwestern Willow Flycatcher

No Action

There is approximately 250 acres of riparian habitat within the project area. These areas are scattered throughout the project area. Some of these areas have small amounts of willows present. Southwestern willow flycatchers have not been found within the project area. No effects are expected to the species because no treatment work will take place within these areas. Affects may occur if riparian areas are not improved or restored. If this does not happen, riparian areas could dry up, and willows will survive without the water needed. This could lead to a decrease in areas for the southwestern willow flycatcher to migrate to if needed but would not eliminate existing habitat for them.

The determination for Alternative A is: “No Effect is expected for Southwestern willow flycatcher.”

Alternative B

Effect are not expected because there will be no thinning or burning within these riparian areas. There is also a buffer around these areas, to prevent any negative disturbance from treatments that are ongoing around riparian area. There are willows within some of the riparian area, but Southwestern Willow flycatchers have not been known to nest there. The only area on the district is in Bluewater Creek which is several miles east of the project boundary. The two forest plan amendments are not expected to have an effect than the original Forest Plan standards and guidelines because those types of treatments will not occur within southwestern willow flycatcher habitat.

Range improvements and wildlife trick tanks are not expect to have a negative impact on species. These improvements will not alter habitat types, and range structures are located outside of suitable habitat because water is already present in riparian area. The structure will be away from riparian area, because water is needed throughout the project area. Decommissioning of unauthorized roads may improve riparian areas, because it could reduce the number of vehicles that travel on them. It would be a reduce compaction to soil, and reduce sedimentation running into riparian area.

Riparian habitat restoration is expected to have a positive impact on riparian habitat, which is a positive impact for southwestern willow flycatchers. Improving these areas will help keep water in the project area, along with riparian vegetation such as willows, sedges, and narrow leaf cottonwoods, and keep springs and stream functioning a healthy levels. Wildlife species needs

these areas to keep populations healthy and sustainable. Also keeping these water sources up will help the overall vegetation communities within the project area.

The determination for Alternative B is: “No Effect.”

Mexican Wolf

No Action

Under this alternative no vegetation treatments would occur, so there would be no effects expected for Mexican wolves because currently there are no known wolves in the areas. If an individual were to find its way to the area water is very important to all wildlife species. By not restoring or projecting water sources such as springs, streams or other riparian areas the wolves would move to other areas where water is more abundant.

Alternative B

Direct Effects

Plan Amendment 1

No direct effects are expected from implementation of Amendment 1. It is a planning-level action, and therefore does not have site-specific effects.

Plan Amendment 2

No direct effects are expected from implementation of Amendment 1. It is a planning-level action, and therefore does not have site-specific effects.

Puerco: Vegetation Treatments

Mexican wolves are not thought to occur within the Puerco project area. It is possible for individuals to utilize this area for foraging, dispersal, or migration. If wolves use this area during project implementation, noise disturbance and increased human presence from implementation operations are likely to deter them from the area.

Puerco: Roads

Mexican wolves are not thought to occur within the Puerco project area. It is possible for individuals to utilize this area for foraging, dispersal, or migration. If wolves use this area during project implementation, noise disturbance and increased vehicular traffic on roads from implementation operations are likely to deter them from the area. Wolves in the area would be at an increased risk for vehicle collisions, however, this effect is discountable. Road improvements in the project area would also cause wolves to temporarily avoid utilizing those areas for foraging or other movements. These effects are unlikely since wolves are not known to occupy this particular area.

Puerco: Range Improvements

Mexican wolves are not thought to occur within the Puerco project area. It is possible for individuals to utilize this area for foraging, dispersal, or migration. If wolves use this area during project implementation, noise disturbance, increased human presence, and increased vehicular traffic from implementation of range improvements would likely deter them from the area temporarily. These effects are unlikely since wolves are not known to occupy this particular area.

Puerco: Watershed Improvements

Mexican wolves are not thought to occur within the Puerco project area. It is possible for individuals to utilize this area for foraging, dispersal, or migration. If wolves use this area during project implementation, noise disturbance, increased human presence, and increased vehicular traffic from implementation of watershed improvements would likely deter them from the area temporarily. These effects are unlikely since wolves are not known to occupy this particular area.

Indirect Effects

Plan Amendment 1

Mexican wolves have no particular habitat preference, and instead utilize a variety of habitats for all aspects of their life history. They do, however, require large areas of contiguous habitat that can include forests and mountainous terrain. Suitable habitat must have sufficient access to prey, protection from excessive persecution, and areas for denning and taking shelter. Improving forest health and preventing stand-replacing wildfires are both overarching goals of Plan Amendment 1, which would ultimately benefit the wolf by preserving contiguous forested habitats and improving habitat for prey (e.g., ungulates and small mammals).

Plan Amendment 2

Mexican wolves have no particular habitat preference, and instead utilize a variety of habitats for all aspects of their life history. They do, however, require large areas of contiguous habitat that can include forests and mountainous terrain. Suitable habitat must have sufficient access to prey, protection from excessive persecution, and areas for denning and taking shelter. Improving forest health and preventing stand-replacing wildfires are both overarching goals of Plan Amendment 2, which would ultimately benefit the wolf by preserving contiguous forested habitats and improving habitat for prey (e.g., ungulates and small mammals).

Puerco: Vegetation Treatments

Mechanical treatments and prescribed fire are aimed at improving overall ecosystem health within the project area. The indirect effects of these treatments would be beneficial in the long-term, and would improve prey base habitat for the wolf. Thinning and low- to moderate-intensity prescribed fire would improve understory vegetation and provide cover habitat for the wolf, which is especially important during reproductive periods (i.e., denning). It is possible the project area could be used as dispersal habitat in the future post-treatment/recovery.

Puerco: Roads

Roads proposed for timber hauling are either FS System Roads or existing (unauthorized) routes that would be maintained or improved to meet the proper engineering standards for hauling. They would not result in a drastic decrease in habitat from the already-disturbed roaded areas. Roads have the potential to fragment habitat. However, proper engineering of proposed roads (including drainage) would decrease the risk of soil erosion and resulting vegetative loss. Rehabilitation of roads would reduce habitat fragmentation and increase habitat continuity for wolf dispersal and foraging.

Puerco: Range Improvements

Range improvements are proposed in various locations throughout the project area. These improvements would aid the Forest Service in managing for dispersal of livestock throughout their respective permitted grazing allotments and pastures. These projects are expected to reduce

concentrated use of certain areas by livestock. These improvements are not expected to alter habitat for the wolf.

Puerco: Watershed Improvements

Various watershed restoration actions are proposed throughout the project area including fencing, erosion control, and stream/spring rehabilitation. These actions are expected to have a positive impact on riparian ecosystem health. Improving watersheds will help retain more water in the project area, and restore springs and streams to properly functioning condition. Healthy riparian vegetative communities would improve prey base and foraging conditions for the wolf within the project area.

CUMULATIVE EFFECTS

The definition of cumulative effects under the Endangered Species Act only includes State, private, and non-Federal actions that are reasonably certain to occur within the action area in the future. Therefore, past and present activities within the project area will not be discussed here (i.e., livestock grazing, mining activities, Bluewater restoration project, thinning on private land). No State, private, or non-Federal actions are expected to occur within the project area, and cumulative effects are not expected.

EFFECTS DETERMINATION

Not likely to jeopardize the Mexican wolf non-essential, experimental population.

Sensitive Species

Spotted Bat

No Action

This alternative could have an impact to spotted bats which may impact species but would not result in a trend toward federal listing or loss of viability because there would be not decommission 200 unauthorized roads. This means that human disturbance could continue to occur in meadows and grass/shrub areas, reducing foraging habitat. Indirect effects are expected for spotted bats because this action can lead to increased use. Security zones for wildlife between the routes would be reduced even further, as the habitat becomes increasingly more fragmented. Unrestricted winter and summer use would increase disturbance (noise) impacts to wildlife incrementally over time. Impacts will become additive, as use increases, and private land development increases as well.

By not restoring up to 250 acres of riparian areas, stream functions, springs, or road drainage crossings this could impact spotted bat because healthy water sources could help foraging and cover habitat for the species.

The determination for Alternative A is: “May Impact Species but Would Not Result in a Trend toward Federal Listing or Loss of Viability” for Spotted bats.

Alternative B

Mechanical treatments and prescribed fire could help the 51,660 acres of spotted bat habitat within the project area. During actual treatments bats may leave the area, but once human activity is complete, they are expected to return to the area. This effect is not expected to have a negative impact to the overall species. These treatments will also take place at different times, so individuals will have other places to move to while treatment occurs within a single area. Ponderosa stands would open up, which would open up the canopy, and improve the health of the understory vegetation such as Gamble's oak. These treatments would alter the number of acres for ponderosa, mix conifer, and pinyon junipers habitat, but reduce competition for them which could improve their overall health. Spotted bats could benefit from these treatments. Understory vegetation types would improve which would provide cover habitat for bats. Overall this alternative is expected to improve recovery habitat for spotted bats. The two forest plan amendments are not expected to have a different effect than the original Forest Plan standards and guidelines. The effects will remain the same, meaning overall improvement of spotted bat habitat is expected.

Range improvements and wildlife trick tanks are not expected to have a negative impact on this species. These improvements will not alter habitat types, and range structures tend to be in open areas outside of suitable habitat. Some of these improvements, depending on their size may also provide water for bats in the area.

Riparian habitat restoration is expected to have a positive impact on spotted bats. Improving these areas will help keep water in the project area, and keep springs and stream functioning at healthy levels. Wildlife species needs these areas to keep populations healthy and sustainable. Also keeping these water sources up will help the overall vegetation communities within the project area. Decommissioning of unauthorized roads may cause bats to leave the area while work is ongoing, but once the work is complete they are expected to return to the area.

The determination for Alternative B is: "May Impact Species but Would Not Result in a Trend toward Federal Listing or Loss of Viability" for Spotted bats.

Gunnison's prairie dog

No Action

This alternative could have an impact to Gunnison's prairie dog, which may impact species but would not result in a trend toward federal listing or loss of viability because under this alternative there would be no decommissioning of unauthorized routes, which means human disturbance would continue to occur in meadows and grass/shrub areas, reducing foraging habitat.

Indirect effects are expected for Gunnison's prairie dogs because decommissioning of unauthorized roads would not occur, which could lead to increase motorized use. Security zones for wildlife between the motorized routes would be reduced even further, as the habitat becomes increasingly more fragmented. Unrestricted winter and summer use would increase disturbance (noise) impacts to wildlife incrementally over time. Impacts will become additive, as motorized use increases, and private land development increases as well. User-created routes may increase erosion, which can have impacts to surrounding habitats far greater than just the route surface itself (down cutting and side channeling, as a result of heavy rains). New user-created routes

would receive increasing use from all types of recreation users over time adding to the current density of routes by an as yet unknown amount.

By not restoring up to 250 acres of riparian areas, stream functions, springs, or road drainage crossings this could impact prairie dogs because healthy water sources could help foraging and cover habitat for the species.

The determination for Alternative A is: “May Impact Species but Would Not Result in a Trend toward Federal Listing or Loss of Viability” for Gunnison’s prairie dogs.

Alternative B

Decommissioning of unauthorized roads may cause prairie dogs to leave the area while work is ongoing, but once the work is complete they are expected to return to the area.

Mechanical treatments and prescribed fire could help 3,359 acres of Gunnison’s prairie dog habitat within the project area. During actual treatments Gunnison’s prairie dogs may leave the area, but once human activity is complete, they are expected to return to the area. This effect is not expected to have a negative impact to the overall species. These treatments will also take place at different times, so individuals will have other places to move to while treatment occurs within a single area. Ponderosa stands would open up, which would open up the canopy, and improve the health of the understory vegetation such as Gamble’s oak. These treatments would alter the number of acres for ponderosa, mix conifer, and pinyon junipers habitat, but reduce competition for them which could improve their overall health. Gunnison’s prairie dogs could benefit from these treatments. Understory vegetation types would improve which would provide cover habitat for Gunnison’s prairie dogs. Overall this alternative is expected to improve recovery habitat for Gunnison’s prairie dogs. The two forest plan amendments are not expected to have a different effect than the original Forest Plan standards and guidelines. The effects will remain the same, meaning overall improvement of Gunnison’s prairie dog habitat is expected.

Range improvements and wildlife trick tanks are not expect to have a negative impact on this species. These improvements will not alter habitat types, and range structures tend to be in open areas outside of suitable habitat. Some of these improvements, depending on their size may also provide water for bats in the area.

Riparian habitat restoration is expected to have a positive impact on Gunnison’s prairie dogs. Improving these areas will help keep water in the project area, and keep springs and stream functioning a healthy levels. Wildlife species needs these areas to keep populations healthy and sustainable. Also keeping these water sources up will help the overall vegetation communities within the project area.

The determination for Alternative A is: “May Impact Species but Would Not Result in a Trend toward Federal Listing or Loss of Viability” for Gunnison’s prairie dogs.

Pale Townsend's big-eared bat

No Action

This alternative could have an impact to pale Townsend's big-eared bat which may impact species but would not result in a trend toward federal listing or loss of viability because there would be not decommission 200 unauthorized roads. This means that human disturbance could continue to occur in meadows and grass/shrub areas, reducing foraging habitat. Indirect effects are expected for spotted bats because this action can lead to increased use. Security zones for wildlife between the routes would be reduced even further, as the habitat becomes increasingly more fragmented. Unrestricted winter and summer use would increase disturbance (noise) impacts to wildlife incrementally over time. Impacts will become additive, as use increases, and private land development increases as well.

By not restoring up to 250 acres of riparian areas, stream functions, springs, or road drainage crossings this could impact spotted bat because healthy water sources could help foraging and cover habitat for the species.

The determination for Alternative A is: "May Impact Species but Would Not Result in a Trend toward Federal Listing or Loss of Viability" for Pale Townsend's big-eared bat.

Alternative B

Decommissioning of unauthorized roads may cause bats to leave the area while work is ongoing, but once the work is complete they are expected to return to the area.

Mechanical treatments and prescribed fire could help 52,243 acres of Pale Townsend's big eared bat habitat within the project area. During actual treatments bats may leave the area, but once human activity is complete, they are expected to return to the area. This effect is not expected to have a negative impact to the overall species. These treatments will also take place at different times, so individuals will have other places to move to while treatment occurs within a single area. Ponderosa stands would open up, which would open up the canopy, and improve the health of the understory vegetation such as Gamble's oak. These treatments would alter the number of acres for ponderosa, mix conifer, and pinyon junipers habitat, but reduce competition for them which could improve their overall health. Pale Townsend's big-eared bats could benefit from these treatments. Understory vegetation types would improve which would provide cover habitat for bats. Overall this alternative is expected to improve recovery habitat for Pale Townsend's big-eared bats. The two forest plan amendments are not expected to have a different effect than the original Forest Plan standards and guidelines. The effects will remain the same, meaning overall improvement of Pale Townsend's big-eared bat habitat is expected.

Range improvements and wildlife trick tanks are not expect to have a negative impact on this species. These improvements will not alter habitat types, and range structures tend to be in open areas outside of suitable habitat. Some of these improvements, depending on their size may also provide water for bats in the area.

Riparian habitat restoration is expected to have a positive impact on spotted bats. Improving these areas will help keep water in the project area, and keep springs and stream functioning a healthy levels. Wildlife species needs these areas to keep populations healthy and sustainable.

Also keeping these water sources up will help the overall vegetation communities within the project area.

The determination for Alternative B is: “May affect species, not likely to adversely affect species” for the Pale Townsend’s big-eared bats.

Northern Goshawk

No Action

Impacts are expected for northern goshawks under the no action alternative. No vegetation treatments could mean, thick trees in the area along with down woody debris can lead to increased risk of a stand replacing fire. This could wipe out suitable nesting and foraging habitat for the species. Indirectly stand replacing fire would also reduce the understory vegetation, which means prey species such as mice, voles, and prairie dogs could lose their habitat sources and either leave the area or die off, thus reducing goshawk food source. This could reduce the population numbers, which would mean a reduction in population recovery.

Indirect effects are expected for goshawk because under this alternative decommission up to 200 miles of unauthorized roads would not occur. This could lead to increased illegal motorized use. Even with the travel management decision many users see a two track road and drive on them, whether it’s legal or not. If these roads are not rehabilitated it could lead to continued use. Security zones for wildlife between the routes would be reduced even further, as the habitat becomes increasingly more fragmented. Unrestricted winter and summer use would increase disturbance (noise) impacts to wildlife incrementally over time. Impacts will become additive, as use increases, and private land development increases as well. User-created routes can be expected to increase erosion, which can have impacts to surrounding habitats far greater than just the trail surface itself (down-cutting and side channeling, as a result of heavy rains). New user-created routes would receive increased use from all types of recreation users over time adding to the current density of routes by an as yet unknown amount.

Water is very important to all species, by not doing improvements to riparian areas, streams, and springs can affect goshawks in the long term. These areas can dry up over time if not monitored and managed properly. If the water goes away, goshawks may also leave the area to find habitat with reliable water sources. This can lead to a decline in the overall population of northern goshawks.

The determination for Alternative A is: “May Impact Species but Would Not Result in a Trend toward Federal Listing or Loss of Viability” for Northern Goshawks.

Alternative B

Mechanical treatments and prescribed fire could help the overall habitat within the project area. During actual treatments goshawks may leave the area, but once human activity is complete, they are expected to return to the area. This effect is not expected to have a negative impact to the overall species. These treatments will also take place at different times, so individuals will have other places to move to while treatment occurs within a single area. Any treatments within PFAs will occur outside of the breeding season, this would reduce negative effects to breeding pairs.

Ponderosa stands would open up, which would open up the canopy, and improve the health of the understory vegetation such as Gamble's oak. These treatments would alter the number of acres for ponderosa, mix conifer, and pinyon junipers habitat, but reduce competition for them which could improve their overall health. Within goshawk habitat the Northern goshawk guidelines will be in place to help with thinning prescriptions. These prescriptions are used to improve the overall northern goshawk habitat. Understory vegetation types would improve which would provide habitat for prey species such as squirrels, and prairie dogs. Overall this alternative is expected to improve recovery habitat for Northern Goshawks.

Amendment 1, Mexican spotted owl habitat management is not expect to have an impact on Northern goshawk because their habitat is outside of the Mexican spotted owl PACs, and treatments will not change for goshawk under this amendment.

Amendment 2, Management of canopy cover and ponderosa pine with an open reference condition within goshawk habitat is expected to have impacts to northern goshawks. These impacts will be similar to impacts listed above. Bring stands to uneven age stands will be beneficial for goshawk and their prey inside and outside of their PFAs. Opening up the understories will improve forage and cover for prey species but still be open enough for goshawk to hunt their prey. Overall this will improve northern goshawk habitat, while maintain a healthy ponderosa pine structure.

Range improvements and wildlife trick tanks are not expect to have a negative impact on species. These improvements will not alter habitat types, and range structures tend to be in open areas outside of suitable nesting habitat. Wildlife trick tanks may even supply water for birds in the areas. These tanks are usually in not visible from roads, and thicker vegetation. Construction of these tanks will occur outside the breeding season if in suitable goshawk habitat.

Riparian habitat restoration is expected to have a positive impact on northern goshawks. Improving these areas will help keep water in the project area, and keep springs and stream functioning a healthy levels. Wildlife species needs these areas to keep populations healthy and sustainable. Also keeping these water sources up will help the overall vegetation communities within the project area.

The determination for Alternative B is: "May Impact Species but Would Not Result in a Trend toward Federal Listing or Loss of Viability" for Northern Goshawks.

Northern leopard frog

No Action

Effects are expected for the No Action alternative. Without vegetation treatments to the area, thick trees in the area along with down woody debris can lead to increased risk of a stand replacing fire. This could shrink riparian areas that northern leopard frog may use if present. This could increase sun exposure to the spring and intermitted stream which could dry out the area eliminating habitat for the sucker. If a stand replacing fire occurs up stream could also have detrimental effects. Sediment and ash can flow downstream, especially during high flow events, which can ruin riparian areas. Both of these events can reduce riparian habitat within the National Forest boundary which could reduce any suitable habitat that may be present with in the

project area. The two forest plan amendments are not expected to have an effect than the original Forest Plan standards and guidelines because those types of treatments will not occur within Northern leopard frog habitat.

Water is very important to all species, by not doing improvements to riparian areas, streams, and springs may impact northern leopard frog habitat in the long term. These areas can dry up over time if not monitored and managed properly. If the water goes away, the species may decline, which could reduce the overall population of the species.

The determination for Alternative A is: “May Impact Species but Would Not Result in a Trend toward Federal Listing or Loss of Viability” for Northern Leopard Frogs.

Alternative B

Effect are not expected because there will be no thinning or burning within these riparian areas. There is also a buffer around these areas, to prevent any negative disturbance from treatments that are ongoing around riparian area.

Range improvements and wildlife trick tanks could have an impact on the species. These improvements will not alter habitat types, and range structures are located outside of suitable habitat because water is already present in riparian area. The structure will be away from riparian area, because water is needed throughout the project area. But due to the fact earth tanks provide water to an area where there is none, could attract any frog in the area to use these water sources for habitat. This could help the species expand their habitat, with some individuals being directly impacted by cattle and other ungulates that use the area. Wildlife trick tanks are not expected to impact the frogs. Decommissioning of unauthorized roads may improve riparian areas, because it could reduce the number of vehicles that travel on them. It would be a reduce compaction to soil, and reduce sedimentation running into riparian area.

Riparian habitat restoration is expected to have a positive impact on riparian habitat, which could be a positive impact for Northern leopard frogs. 259 acres of riparian habitat will have improvements occurring within the project area. There will be no work directly in the riparian areas which is expected to have no impacts to the frogs. Springs are expected to have improvements to preserve them and the water source. Improving these areas will help keep water in the project area, along with riparian vegetation such as willows, sedges, and narrow leaf cottonwoods, and keep springs and stream functioning a healthy levels. Wildlife species needs these areas to keep populations healthy and sustainable. Also keeping these water sources up will help the overall vegetation communities within the project area. The two forest plan amendments are not expected to have a different effect than the original Forest Plan standards and guidelines. The effects will remain the same, meaning overall improvement of Northern leopard frog habitat is expected.

The determination for Alternative A is: “May Impact Species but Would Not Result in a Trend toward Federal Listing or Loss of Viability” for Northern Leopard frog” for Northern Leopard Frogs.

Villous groundcover milkvetch

No Action

Effects are expected for villous groundcover milkvetch under the no action alternative. No vegetation treatments could mean, trees with down woody debris can lead to increased risk of a stand replacing fire. This could wipe out the species if the fire happen where the species is located. This could reduce the population numbers, which would mean a reduction in population recovery.

Effects to this species are expected because decommission of 200 miles of unauthorized roads would not occur and could lead motorist to travel illegally in areas where the Villous groundcover milkvetch may occur, which could have a negative effect. User-created routes can be expected to increase erosion, which can have impacts to surrounding habitats far greater than just the trail surface itself (down-cutting and side channeling, as a result of heavy rains). New user-created routes would receive increase use from all types of recreation users over time adding to the current density of routes by an as yet unknown amount.

Water is very important to all species, by not doing improvements to riparian areas, streams, and springs may affect villous groundcover milkvetch in the long term. These areas can dry up over time if not monitored and managed properly. If the water goes away, the plants in this area may decline, which could reduce the overall population of the species.

The determination for Alternative A is: “May Impact Species but Would Not Result in a Trend toward Federal Listing or Loss of Viability” for Villous Groundcover Milkvetch.

Alternative B

Decommissioning of unauthorized roads are may impact the villous groundcover milkvetch. Roads that are being decommissioned could improve soil condition by eliminating the existing road, which would also keep traffic off, which eliminated compaction. Once this is complete, the plant species could start to grow along the old roads, which would help their overall population.

Mechanical treatments and prescribed fire could help the 40,750 acres of Villous groundcover milkvetch habitat within the project area. These treatments are affect to have a positive effects to this species. The villous groundcover milkvetch is located in areas were soil health is low, and so treatments will be adjusted to have minimal damage in these areas. The types of treatments are expected to improve the overall health of the soil, which will improve the habitat for the villous groundcover milkvetch. These treatments would alter the number of acres for pinyon-juniper habitat, but reduce competition for them which could improve their overall health. Overall this alternative is expected to improve habitat for villous groundcover milkvetch. The two forest plan amendments are not expected to have a different effect than the original Forest Plan standards and guidelines. The effects will remain the same, meaning overall improvement of Villous groundcover milkvetch habitat is expected.

Range improvements and wildlife trick tanks are not expect to have a negative effect on species. These improvements will not alter habitat types, but cattle do tend to gather around watering holes, which prevents plants from growing in the immediate area. These structure are staying in

the same footprint, so no additional ground disturbance is expected. Before any new structures go up, specialist will check the area to make sure this species is not present.

Riparian habitat restoration may have a positive effect on villous groundcover milkvetch. Improving these areas will help keep water in the project area, and keep springs and stream functioning a healthy levels. All plant species needs these areas to keep populations healthy and sustainable. Also keeping these water sources up will help the overall vegetation communities within the project area.

The determination for Alternative B is: “May Impact Species but Would Not Result in a Trend toward Federal Listing or Loss of Viability” for Villous Groundcover Milkvetch.

Sivinski’s fleabane

No Action

Effects are expected for Sivinski’s Flea Bane under the no action alternative. No vegetation treatments could mean, trees with down woody debris can lead to increased risk of a stand replacing fire. This could wipe out the species if the fire happen where the species is located. This could reduce the population numbers, which would mean a reduction in population recovery.

Effects to this species are expected because decommission of 200 miles of unauthorized roads would not occur and could lead motorist to travel illegally in areas where the Sivinski’s Fleabane may occur, which could have a negative effect. User-created routes can be expected to increase erosion, which can have impacts to surrounding habitats far greater than just the trail surface itself (down-cutting and side channeling, as a result of heavy rains). New user-created routes would receive increase use from all types of recreation users over time adding to the current density of routes by an as yet unknown amount.

Water is very important to all species, by not doing improvements to riparian areas, streams, and springs may affect Sivinski’s flea bane in the long term. These areas can dry up over time if not monitored and managed properly. If the water goes away, the plants in this area may decline, which could reduce the overall population of the species.

The determination for Alternative A is: “May Impact Species but Would Not Result in a Trend toward Federal Listing or Loss of Viability” for Sivinski’s Flea Bane.

Alternative B

Decommissioning of unauthorized roads are may impact the Sivinski’s Flea Bane. Roads that are being decommissioned could improve soil condition by eliminating the existing road, which would also keep traffic off, which eliminated compaction. Once this is complete, the plant species could start to grow along the old roads, which would help their overall population.

Mechanical treatments and prescribed fire could help 25,701 acres of Sivinski’s flea bane habitat within the project area. These treatments are affect to have a positive effects to this species. The Sivinski’s Flea Bane is located in areas were soil health is low, and so treatments will be adjusted to have minimal damage in these areas. The types of treatments are expected to improve the

overall health of the soil, which will improve the habitat for the Sivinski's Flea Bane. These treatments would alter the number of acres for pinyon-juniper habitat, but reduce competition for them which could improve their overall health. Overall this alternative is expected to improve habitat for Sivinski's Flea Bane. The two forest plan amendments are not expected to have a different effect than the original Forest Plan standards and guidelines. The effects will remain the same, meaning overall improvement of Sivinski's flea bane habitat is expected.

Range improvements and wildlife trick tanks are not expected to have a negative effect on species. These improvements will not alter habitat types, but cattle and other ungulates do tend to gather around watering holes, which prevents plants from growing in the immediate area. These structures are staying in the same footprint, so no additional ground disturbance is expected. Before any new structures go up, specialists will check the area to make sure this species is not present.

Riparian habitat restoration may have a positive effect on Sivinski's Flea Bane. Improving these areas will help keep water in the project area, and keep springs and stream functioning at healthy levels. All plant species needs these areas to keep populations healthy and sustainable. Also keeping these water sources up will help the overall vegetation communities within the project area.

The determination for Alternative A is: "May Impact Species but Would Not Result in a Trend toward Federal Listing or Loss of Viability" for Sivinski's Flea Bane.

Zuni milkvetch

No Action

Effects are expected for Zuni milkvetch under the no action alternative. No vegetation treatments could mean, trees with down woody debris can lead to increased risk of a stand replacing fire. This could wipe out the species if the fire happens where the species is located. This could reduce the population numbers, which would mean a reduction in population recovery.

Effects to this species are expected because decommissioning of 200 miles of unauthorized roads would not occur and could lead motorists to travel illegally in areas where the Zuni milkvetch may occur, which could have a negative effect. User-created routes can be expected to increase erosion, which can have impacts to surrounding habitats far greater than just the trail surface itself (down-cutting and side channeling, as a result of heavy rains). New user-created routes would receive increased use from all types of recreation users over time adding to the current density of routes by an as yet unknown amount.

Water is very important to all species, by not doing improvements to riparian areas, streams, and springs may affect Zuni milkvetch in the long term. These areas can dry up over time if not monitored and managed properly. If the water goes away, the plants in this area may decline, which could reduce the overall population of the species.

The determination for Alternative A is: "May Impact Species but Would Not Result in a Trend toward Federal Listing or Loss of Viability" for Zuni Milkvetch.

Alternative B

Decommissioning of unauthorized roads may impact the Zuni milkvetch. Roads that are being decommissioned could improve soil condition by eliminating the existing road, which would also keep traffic off, which eliminated compaction. Once this is complete, the plant species could start to grow along the old roads, which would help their overall population.

Mechanical treatments and prescribed fire could help 25,701 acres of Zuni milkvetch habitat within the project area. These treatments are expected to have positive effects on this species. The Zuni milkvetch is located in areas where soil health is low, and so treatments will be adjusted to have minimal damage in these areas. The types of treatments are expected to improve the overall health of the soil, which will improve the habitat for the Zuni milkvetch. These treatments would alter the number of acres for pinyon-juniper habitat, but reduce competition for them which could improve their overall health. Overall this alternative is expected to improve habitat for Zuni milkvetch. The two forest plan amendments are not expected to have a different effect than the original Forest Plan standards and guidelines. The effects will remain the same, meaning overall improvement of Zuni milkvetch habitat is expected.

Range improvements and wildlife water tanks are not expected to have a negative effect on species. These improvements will not alter habitat types, but cattle and other ungulates do tend to gather around watering holes, which prevents plants from growing in the immediate area. These structures are staying in the same footprint, so no additional ground disturbance is expected. Before any new structures go up, specialists will check the area to make sure this species is not present.

Riparian habitat restoration may have a positive effect on Zuni milkvetch. Improving these areas will help keep water in the project area, and keep springs and stream functioning at healthy levels. All plant species needs these areas to keep populations healthy and sustainable. Also keeping these water sources up will help the overall vegetation communities within the project area.

The determination for Alternative B is: “May Impact Species but Would Not Result in a Trend toward Federal Listing or Loss of Viability” for Zuni milkvetch.

Arizona leatherflower Clustered leatherflower

No Action

Effects are expected for Arizona leatherflower Clustered leatherflower under the no action alternative. No vegetation treatments could mean, trees with down woody debris can lead to increased risk of a stand replacing fire. This could wipe out the species if the fire happens where the species is located. This could reduce the population numbers, which would mean a reduction in population recovery.

Effects to this species are expected because decommissioning of 200 miles of unauthorized roads would not occur and could lead motorists to travel illegally in areas where the Arizona leatherflower Clustered leatherflower may occur, which could have a negative effect. User-created routes can be expected to increase erosion, which can have impacts on surrounding

habitats far greater than just the trail surface itself (down-cutting and side channeling, as a result of heavy rains). New user-created routes would receive increase use from all types of recreation users over time adding to the current density of routes by an as yet unknown amount.

Water is very important to all species, by not doing improvements to riparian areas, streams, and springs may affect Arizona leatherflower Clustered leatherflower in the long term. These areas can dry up over time if not monitored and managed properly. If the water goes away, the plants in this area may decline, which could reduce the overall population of the species.

The determination for Alternative A is: “May Impact Species but Would Not Result in a Trend toward Federal Listing or Loss of Viability” for Arizona leatherflower Clustered leatherflower.

Alternative B

Decommissioning of unauthorized roads are may impact the Arizona leatherflower Clustered leatherflower. Roads that are being decommissioned could improve soil condition by eliminating the existing road, which would also keep traffic off, which eliminated compaction. Once this is complete, the plant species could start to grow along the old roads, which would help their overall population.

Mechanical treatments and prescribed fire could help 7,407 acres of Arizona leatherflower Clustered leatherflower habitat within the project area. These treatments are affect to have a positive effects to this species. The Arizona leatherflower Clustered leatherflower is located in areas were soil health is low, and so treatments will be adjusted to have minimal damage in these areas. The types of treatments are expected to improve the overall health of the soil, which will improve the habitat for the Arizona leatherflower Clustered leatherflower. These treatments would alter the number of acres for pinyon-juniper habitat, but reduce competition for them which could improve their overall health. Overall this alternative is expected to improve habitat for Arizona leatherflower Clustered leatherflower. The two forest plan amendments are not expected to have a different effect than the original Forest Plan standards and guidelines. The effects will remain the same, meaning overall improvement of Arizona leatherflower Clustererd leatherflower habitat is expected.

Range improvements and wildlife trick tanks are not expect to have a negative effect on species. These improvements will not alter habitat types, but cattle and other ungulates do tend to gather around watering holes, which prevents plants from growing in the immediate area. These structure are staying in the same footprint, so no additional ground disturbance is expected. Before any new structures go up, specialist will check the area to make sure this species is not present.

Riparian habitat restoration of 250 acres may have a positive effect on Arizona leatherflower Clustered leatherflower. Improving these areas will help keep water in the project area, and keep springs and stream functioning a healthy levels. All plant species needs these areas to keep populations healthy and sustainable. Also keeping these water sources up will help the overall vegetation communities within the project area.

A determination for this Alternative is: “May Impact Species but Would Not Result in a Trend toward Federal Listing or Loss of Viability” for Arizona leatherflower Clustered leatherflower.

Chaco milkvetch

No Action

Effects are expected for Chaco milkvetch under the no action alternative. No vegetation treatments could mean, trees with down woody debris can lead to increased risk of a stand replacing fire. This could wipe out the species if the fire happen where the species is located. This could reduce the population numbers, which would mean a reduction in population recovery.

Effects to this species are expected because decommission of 200 miles of unauthorized roads would not occur and could lead motorist to travel illegally in areas where the Chaco milkvetch may occur, which could have a negative effect. User-created routes can be expected to increase erosion, which can have impacts to surrounding habitats far greater than just the trail surface itself (down-cutting and side channeling, as a result of heavy rains). New user-created routes would receive increase use from all types of recreation users over time adding to the current density of routes by an as yet unknown amount.

Water is very important to all species, by not doing improvements to riparian areas, streams, and springs may affect Chaco milkvetch in the long term. These areas can dry up over time if not monitored and managed properly. If the water goes away, the plants in this area may decline, which could reduce the overall population of the species.

The determination for Alternative A is: “May Impact Species but Would Not Result in a Trend toward Federal Listing or Loss of Viability” for Chaco milkvetch.

Alternative B

Decommissioning of unauthorized roads are may impact the Chaco milkvetch. Roads that are being decommissioned could improve soil condition by eliminating the existing road, which would also keep traffic off, which eliminated compaction. Once this is complete, the plant species could start to grow along the old roads, which would help their overall population.

Mechanical treatments and prescribed fire could help 25,701 acres of Chaco milkvetch habitat within the project area. These treatments are affect to have a positive effects to this species. The Chaco milkvetch is located in areas were soil health is low, and so treatments will be adjusted to have minimal damage in these areas. The types of treatments are expected to improve the overall health of the soil, which will improve the habitat for the Chaco milkvetch. These treatments would alter the number of acres for pinyon-juniper habitat, but reduce competition for them which could improve their overall health. Overall this alternative is expected to improve habitat for Chaco milkvetch. The two forest plan amendments are not expected to have a different effect than the original Forest Plan standards and guidelines. The effects will remain the same, meaning overall improvement of Chaco milkvetch habitat is expected.

Range improvements and wildlife trick tanks are not expect to have a negative effect on species. These improvements will not alter habitat types, but cattle and other ungulates do tend to gather around watering holes, which prevents plants from growing in the immediate area. These structure are staying in the same footprint, so no additional ground disturbance is expected. Before any new structures go up, specialist will check the area to make sure this species is not present.

Riparian habitat restoration may have a positive effect on Chaco milkvetch. Improving these areas will help keep water in the project area, and keep springs and stream functioning at healthy levels. All plant species needs these areas to keep populations healthy and sustainable. Also keeping these water sources up will help the overall vegetation communities within the project area.

The determination for Alternative B is: “May Impact Species but Would Not Result in a Trend toward Federal Listing or Loss of Viability” for Chaco milkvetch.

Migratory Birds and MIS

No Action

Under the no action alternative impacts are expected. Vegetation treatments would not occur, which would leave veg types as they currently are. But due to all of the dense trees and debris on the ground, a large wildfire can wipe out large portions of the vegetation and reduce the overall number of acres for each veg type. For some species this could impact them negatively, by eliminated nesting habitat within the project area. Other species such as elk and deer could come back to the area once the understory vegetation such as grasses and forbs begin to grow back. Overall this would not cause any species to decline in numbers due to the existing habitat surrounding the project area.

Areas where trees are dense and canopy cover is thick, these areas would continue to keep sunlight from the understory vegetation. This would not help understory vegetation such as grasses and forbs and could eliminate them in some areas.

Illegal use of unauthorized roads would could lead to increase use of motorized travel in areas where MIS species may occur, which could stress individual species causing them to leave them area. Security zones for wildlife between the routes would be reduced even further, as habitat becomes increasingly more fragmented. Unrestricted winter and summer use would increase disturbance (noise) impacts to wildlife incrementally over time. New user-created roads could receive increasing use from all types of recreation users over time adding to the current density of trails and roads by an as yet unknown amount. Also under this alternative there would be no rehabilitation of unauthorized motorized routes which means human disturbance would continue to use in between designated routes throughout the project area causing wildlife to move during critical times and increase stress.

No riparian habitat would be improved, but due to the low numbers of acres within the project area, impacts are expected to be minimal.

Alternative B

Decommissioning of unauthorized roads may cause wildlife to leave the area while work is ongoing, but once the work is complete wildlife is expected to return to the area. In areas of nesting bird species, this would occur outside the breeding season which would minimize this impact.

Mechanical treatments and prescribed fire could help the overall habitat within the project area. During actual treatments wildlife will leave the area, but once human activity is complete, wildlife species will return to the area. This impact is not expected to have a negative impact to overall species populations. These treatments will also take place at different times, so

individuals will have other places to move to while treatment occurs within a single area. Ponderosa stands would open up, which would open up the canopy, and improve the health of the understory vegetation. These treatments would alter the number of acres for ponderosa, mix conifer, and pinyon junipers habitat, but reduce competition for them which could improve their overall health. Management indicator species would benefit from these improvements. Improvement of grazing, and foraging habitat would help species such as deer, elk and turkey. Understory vegetation types would improve which would provide cover and protection from weather such as rain and snow, and would also provide protection for animals with young. Overall this alternative is expected to lead to an upward trend to Management indicator species and their habitat types. The two forest plan amendments are not expected to have a different effect than the original Forest Plan standards and guidelines. The effects will remain the same, meaning overall improvement of migratory birds discussed above habitat is expected.

Range improvements are not expect to have a negative impact on species. These improvements will not alter habitat types, so no change is expected for vegetation. Some of these improvements are water sources with is expect to help wildlife by providing more water sources.

Riparian habitat restoration is expected to have a positive impact on management indicator species. Improving these areas will help keep water in the project area, and keep springs and stream functioning a healthy levels. Wildlife species needs these areas to keep populations healthy and sustainable. Also keeping these water sources up will help the overall vegetation communities within the project area.

Cumulative Effects for all species discussed above

Alternative A

Under the No Action Alternative, no mechanical treatments, prescribed fire, riparian restoration, range improvements, wildlife trick tank installation, and decommission of unauthorized roads would not occur within the projection boundary. With the travel management decision many users see a two track road and drive on them, whether it's legal or not. If these roads are not rehabilitated it could lead to continued use. Unrestricted winter and summer use would increase disturbance (noise) impacts to all threatened, endangered and sensitive species incrementally over time and private land development increases as well. User-created trails can be expected to increase erosion, which can have impacts to surrounding habitats far greater than just the road surface itself (down cutting and side channeling, as a result of heavy rains). New user-created roads would receive increasing use from all types of users over time, adding to the current density of roads by an as yet unknown amount.

Ongoing projects such as WUI treatments, cattle grazing, mountain bike trails, horse trails, hiking trails and timber treatments are expected to continue as regeneration takes place; unrestricted OHV use off of roads/trails may create routes through these treatments after they occur (since habitat will be more open). This potentially reduces forage recovery (and wildlife security) in the thinned areas. In areas such as washes and areas of more gentle terrain (low

ridges between the washes), loss of vegetation could potentially be severe in these dry habitats, reducing forage for wildlife and increasing erosion. Areas where mining exploration occurs and possible actual mining in the future may also have an impact on wildlife. Noise disturbance from the equipment used within the mine may keep wildlife away from surrounding areas of suitable foraging habitat. Cumulative impacts over time to wildlife from noise disturbance and habitat loss would be greatest under the No Action Alternative and could impact species listed in this document.

Alternative B

Cumulative impacts to threatened, endangered and sensitive species listed above are discussed in this section; it focuses impacts to wildlife species from noise disturbance, direct mortality, and habitat degradation. The boundary for cumulative effects is the Zuni mountain range. Treatments and projects considered as past, present, and reasonably foreseeable future actions include: prescribed burns; WUI fuels reduction treatments; cattle grazing; special use permits; timber thinning; dead and down fuel wood gathering; mining and exploration.

Mechanical treatments, prescribed fire, riparian restoration, range improvements, wildlife truck tank installation, and decommission of unauthorized roads along with cattle grazing, past timber harvesting and past prescribed burning have been ongoing, could have an effect to wildlife. Individual species would have to find other areas for security during times when human disturbance is present, meaning their habitat could be fragmented and less secure.

Ongoing projects such as WUI treatments, cattle grazing, fuel wood gathering of dead and down timber, and timber treatments are expected to continue. This potentially reduces forage recovery (and wildlife security) in the disturbed areas. In areas such as washes and areas of more gentle terrain (low ridges between the washes), loss of vegetation could potentially be severe in these dry habitats, reducing forage for wildlife and increasing erosion. Areas where exploration occurs and possible actual mining in the future may also have an impact on wildlife. Noise disturbance from the equipment used within the mine may keep wildlife away from surrounding areas of suitable foraging habitat. Cumulative impacts over time to wildlife from noise disturbance and habitat improve could occur under this Alternative. These effects are not expected to cause a decline in population for threatened or endangered species or lead in a trend toward federal listing for sensitive species.

3.6 Recreation Resources

Affected Environment

There are three developed sites located within the analysis area, two campgrounds and one day use site. The campgrounds include Quaking Aspen and McGaffey, and the day use site McGaffey Lake fishing site.

There are approximately 80 miles of non-motorized trails within the analysis area, 27 existing and 53 under construction. These trails are managed as pack and saddle, bicycle, and hiker/pedestrian. There are two existing trailheads and one proposed for construction associated with this trail system within the analysis area. There are approximately 11 miles of motorized ATV trails within the analysis area.

Forest Service recreation management is guided by the Recreation Opportunity Spectrum (ROS), which allocates and manages outdoor recreation opportunities and activities by natural resource setting. The analysis area contains three of the six ROS classes. The distribution of the ROS classes in the analysis area is shown in the table and map below. ROS is a framework for understanding the relationships and interactions between recreational benefits from the Forest and the settings in which the users experience them.

Figure 3.6.1. Developed Recreation Sites, Trails and Recreation Opportunity Spectrum

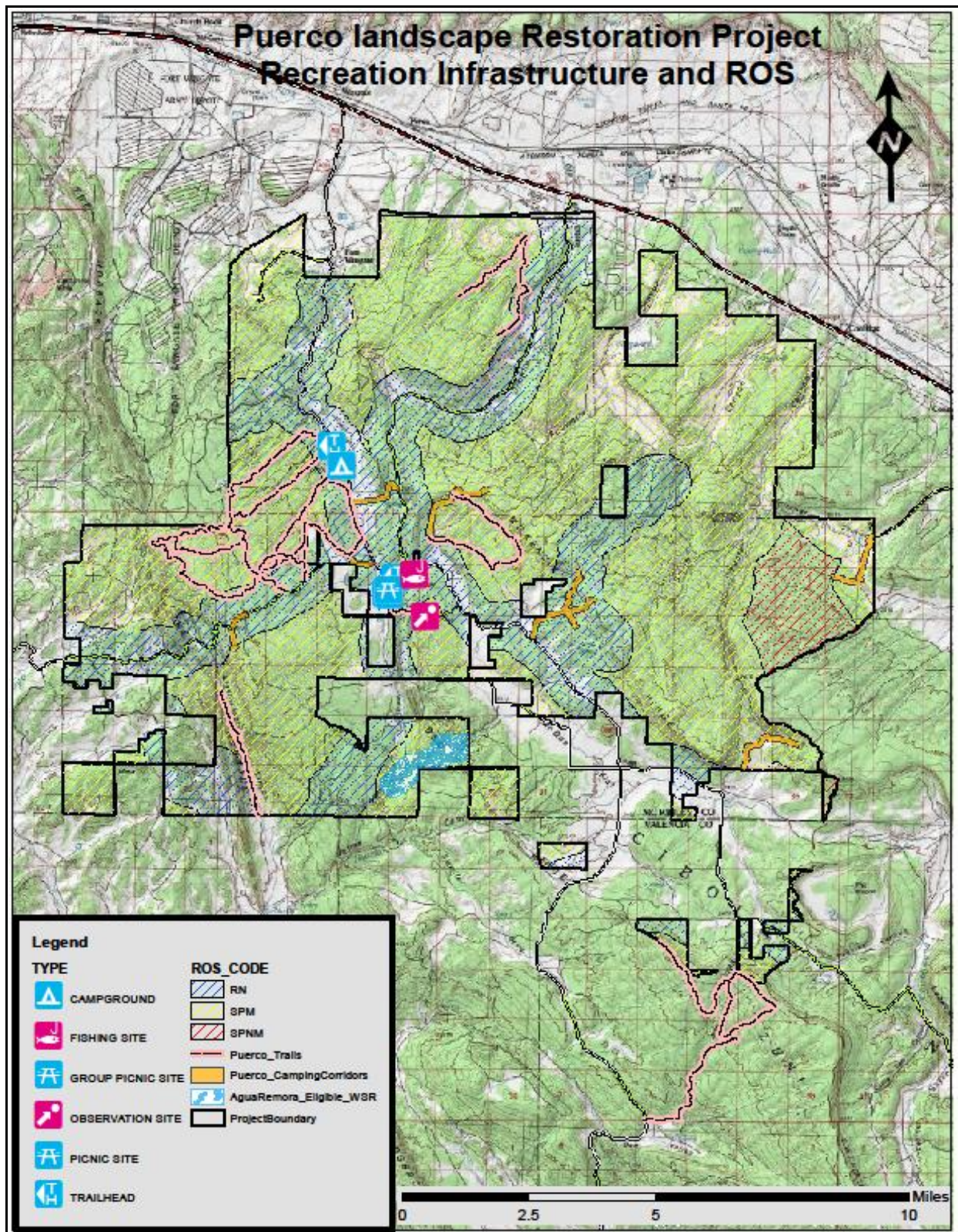


Table 3.6.1. ROS distribution in the analysis area

ROS Class	Acres	Percent of Area	Where found within the analysis area?
Roaded Natural (RN)	25,369	31	RN is a natural appearing environment with low to moderate interaction between users. RN is found along New Mexico State Highway 400, County Road 50, NFSR 151, 164b, 164c, 191, 503a and 547.
Semi-Primitive Motorized (SPM)	52,790	66	SPM is a natural appearing environment of large size with low interaction between users and the opportunity for a high degree of interaction with the natural environment. SPM encompass the majority of the analysis area outside of the RN corridors.
Semi-Primitive Non-motorized (SPNM)	2,653	3	SPNM is a natural appearing environment of large size with low interaction between users and the opportunity for a high degree of interaction with the natural environment. SPNM is found near the old Continental Divide radar site and east of Barometer Mountain.

Environmental Consequences

Alternative A – No Action

Developed recreation sites and motorized & non-motorized use would continue within the analysis area. Forest users would retain motorized and non-motorized access within the analysis area.

There would be no impact to developed recreation sites, trails, and trailheads. These recreation sites will continue to be managed to meet public health and safety standards and optimum use. Recreationist seeking developed site experience would continue to use the recreation sites throughout the summer use season.

This alternative provides the greatest opportunity for uninterrupted motorized and non-motorized recreation activities described in the affected environment as compared with Alternative B. Motorized trails would remain open to wheeled vehicle traffic except during wildlife Habitat Protection Area closure from December 15 through April 15. Non-motorized trails would remain open year round and dispersed recreation use would continue to occur. Forest users would continue to utilize all existing trailheads, non-motorized trails, and dispersed recreation sites without any project activity interruptions.

Alternative B

There will be no direct effects to the developed recreation sites and site management since the majority of the vegetation treatment and prescribed burn activities would occur outside the designated recreation site. However, there are some treatments that are proposed to occur within the recreation sites. For those activities, there will be direct effects to Quaking Aspen and McGaffey campgrounds, and the day use fishing site at McGaffey Lake. For thinning in the campgrounds, there is a potential of damaging recreation improvements during thinning and burning operations. This effect would be minimized by implementing the design criteria to avoid dropping trees on recreation infrastructure and improvements along with pile burning with these

recreation sites. Proposed thinning, lop/scatter, and burning would have minimal impact to motorized and non-motorized trails but for the thinning with commercial removal, the impact to trails would be through disturbance of the trail tread during timber extraction operation.

Thinning trees in the campground would improve site management and experience for users through a healthy and aesthetically pleasing environment within the recreation sites. In addition, the risk of damage from a wild fire to the facilities and improvements would decrease as a result of thinning trees. There are no anticipated management changes to the developed sites because thinning and prescribed burn activities will be conducted after the campgrounds have been closed for the season.

This alternative would have a direct effect on recreation uses and motorized and non-motorized access within the analysis area. Public access into cutting/burning units would be affected, specifically during periods of operation. A majority of the non-motorized trail access could be affected up to a year or more, depending on size, terrain, type of prescription within the unit, and weather conditions (Olson, 2017). Timing of operation would occur year round therefore restricted recreation access would vary depending on the implementation schedule. Follow up prescribed burning activities would limit dispersed recreation access during burning operations which generally are 3 to 5 day duration depending on the size of the unit. The greatest impact would occur to the non-motorized trail users where portions of all the non-motorized trails within the analysis area overlap with the proposed activities which would result in user displacement during implementation. As displaced non-motorized trail users seek to enjoy outdoor recreation activities, they could begin to develop new unauthorized trails. Mountain bikers in particular have expressed dismay to closing areas off to mountain bike use (Zuni Mountain Trails Project EA, 2017). To a lesser extent, displacement would occur to motorized trail users during implementation of this project. The motorized use community are even more vocal about limiting motorized access or closures (Travel Management EA, 2009).

Cumulative Effects

The analysis area has been impacted, in the past, to some degree by various past, present, and reasonable foreseeable future actions. Activities include timber harvest prescribed burns, livestock grazing, road maintenance, and implementation of ZMTP.

A temporal and spatial bounding overlap analysis was used to determine the cumulative effects. Spatial data is not available for the prescribed burn activities therefore no spatial overlap was analyzed. There are no temporal overlaps with past timber and prescribed burn activities but there are temporal overlaps with grazing, road maintenance, and ZMTP implementation.

There are spatial overlap with past timber activities with timber harvesting activities with portions of motorized trail 2302, portions of non-motorized trails 2001, 2006, 2007, 2009, 2010, 2012, 2013, 2014, 2015, and developed recreation sites; Quaking Aspen and Hilso Trailhead.

There are no cumulative effects to the Developed Recreation Resources from grazing, prescribed fires, and road maintenance. Even though livestock grazing occurs during the summer season, livestock are not permitted within the recreation sites. Prescribed fires have occurred more than 10 years in the past and considered to be outside the temporal bounding for cumulative effects. Road maintenance effects are limited to the road prism

There are no cumulative effects to recreation opportunities and displacement from livestock grazing or road maintenance because dispersed recreation opportunities would not be interrupted despite some temporal and spatial overlap. Road maintenance occurring where the non-motorized trails intersect system roads generally takes less than an hour to complete. The incremental contributions from the past, present, and foreseeable future projects will not exceed the threshold for develop and dispersed recreation resources.

3.7 Scenic Resources

Affected Environment

“Scenic Integrity” has to do with the “state of naturalness” or the “state of disturbance created by human activities or alterations”. The existing scenic integrity of the CNF has been mapped during the Forest Plan Revision Process, and identifies the existing condition of scenery. Often scenic integrity has to do with the size, scale, and location of past timber harvest units and road building and how these past activities relate to the inherent landscape character (Agriculture Handbook 701, Landscape Aesthetics: A Handbook for Scenery Management, Chapter 2, Scenic Integrity, pages 2-2 through 2-7). Existing Forest Plan direction for Visual Quality Objectives (VQO) will be adhered to until the Record of Decision for the revised Forest Plan is signed.

The majority of the Rio Puerco project area consists of landscapes with existing Moderate scenic integrity. There are inclusions of High, and Very Low scenic integrity but these are very site specific. The following defines the Scenic Integrity levels represented in the Rio Puerco project area:

Table 3.7.1. Existing Scenic Integrity in Project Area

Scenic Integrity Level	Definition	Acres in Project Area
High	Landscapes where the valued landscape character “appears intact” have high scenic integrity. Deviation may be present but must repeat the form, line, color, texture and pattern common to the landscape character so completely and at such a scale that they are not evident. In the project area, landscapes with High scenic integrity include the Hogback ridge and Bill Spring/Cottonwood Canyon area.	906

Puerco Collaborative Forest Landscape Restoration Project
3. Environmental Consequences

Moderate	Landscapes where the valued landscape character “appears slightly altered” have moderate scenic integrity. Noticeable deviations must remain visually subordinate to the landscape character being viewed. Moderate scenic integrity areas in the project area are those where past timber harvesting and road building have taken place. The majority of the project area is Moderate, meaning past activities are slightly evident.	78,418
Low	Landscapes where the valued landscape character “appears moderately altered” have low scenic integrity. In these areas, deviations begin to dominate the valued landscape character being viewed while still borrowing from valued attributes such as size, shape, edge effect, and pattern of natural openings or vegetation type changes. No acres of Low occur in the project area.	0
Very Low	Landscapes where the valued landscape character “appears heavily altered” have very low scenic integrity. In these areas, deviations may strongly dominate the valued landscape character being viewed.	439

Visual Quality Objectives (VQO) are measurable standards for the management of visual resources of the landscape. Refers to the degree of acceptable alterations of the characteristic landscape based on the importance of aesthetics. Visual Quality Level (VQL) was the title given during the inventory. Because of intensive review in this process, the levels will now be called “Objectives” for the land. Objectives used in the ALRMP are:

Table 3.7.2. Existing Visual Quality Objective in Project Area

Visual Quality Objective	Definition	Acres in Project Area
Retention	Man’s activities are generally not evident to the casual visitor. In the project area, landscapes with a VQO of Retention include steep areas in full view of County Road 50 west of McGaffey Lake and west of State Highway 400 north of Quaking Aspen Campground.	602
Partial Retention	In general man’s activities may be evident but must be subordinate to the characteristic landscape.	34,857
Modification	Man’s activity may dominate the characteristic landscape but must, at the same time, utilize naturally established form, line, color and texture. Man’s activities should appear as natural occurrences when viewed from foreground or middle ground.	22,922
Maximum Modification	Man’s activity may dominate the characteristic landscape but should appear as a natural occurrence when viewed as background.	22,638

Landscape Visibility

Landscape visibility addresses the relative importance and sensitivity of what is seen and perceived in the landscape. The project area is quite large and can be viewed from a variety of locations within and outside of the project boundary. The best locations to view scenery within the project area are from high use roads, recreation sites, and trails. These viewpoints are considered most important in evaluating changes to scenery since they receive the greatest amount of use and since most recreation users have a high degree of sensitivity to or appreciation of visual quality/scenery. Distance is also imperative to viewer experience and perception of scenery. Foreground is the ¼- ½ mile in front of the observer, and the immediate foreground is

300 feet in front of the observer, and is also High Sensitivity. Middle ground is 3-5 miles from the observer, and Background is 5 miles and beyond from the viewer.

Existing Landscape Character

The existing landscape, or scenic, character describes the physical appearance and cultural context of a landscape giving an area a scenic identity or 'sense of place.' The existing scenic character provides a baseline from which to measure impacts to visual quality from proposed project activities. The following existing scenic character is taken from the Cibola National Forest Scenic Character Report, done in 2015 as part of Forest Plan Revision.

The Rio Puerco project area is located within the Zuni Mountains. Within the Forest Service's "The National Hierarchical Framework of Ecological Units" (ECOMAP 1993), the project area lies within the Colorado Plateau Semi-Desert Province, Navajo Canyonlands Section, Subsections 95, North Plains and Subsection 107, Mountain Division.

Valued Landscape Attributes

The Zuni Mountains are a significant visual element in the landscape in central northwest New Mexico. The Zuni Mountains provide the natural backdrop which defines a sense of place for many communities including towns, villages and pueblos. The Zuni Mountains are not very steep, but gentle rolling mountains and hills. They were formed by volcanic activity and erosion. Vegetation is dominated by ponderosa pine at higher elevations and pinyon-juniper types on the lower slopes. Distinctive vegetation includes riparian fingers along intermittent and perennial streams and a few pockets of aspen and Engelmann spruce.

Landscapes viewed from State Highway 400 include the historic landscape around Ft Wingate. McKenzie Ridge is viewed on the north side south of McGaffey campground. Oso Ridge is visible in the southwestern portion of the project area.

Slopes

Dominant landforms include gently rolling slopes with hills and valleys adjacent to the steep scarp slopes. Common landform features include mountains, piedmonts, alluvial fans, tilt-block faulting, structural domes and stream terraces. A few scarp slopes and rock outcrops define the distinctive landform. The area is characterized by horizontal sandstone beds that have been subject to great erosion creating tablelands, cuevas, rock terraces, retreating escarpments, shallow canyons, and dry washes. The hogback in the south west portion of the division is a distinctive landform.

Vegetation

Common vegetative species include ponderosa pine and scattered patches of pinyon-juniper, patches of alderleaf mountain mahogany and ponderosa pine-Douglas fir mix. Gambel oak is the primary understory species other than grasses. Aspen is another distinctive vegetation type.

Deciduous shrubs and pockets of aspen provide contrasting colors and textures among the evergreen species. Deciduous trees add striking visual diversity, especially when intermingled with conifer stands. These trees also create an impressive scenic impact in the fall when the leaves have turned shades of golden and bright yellow.

Many meadows occur to the east of Fort Wingate and northeast of Forest Roads 178 and 140 between Bluewater Creek and the Zuni River. The dry meadows that are dominated by grasses including western wheatgrass and grama mix. Some showy species include iris, yarrow, and cinquefoil.

Riparian

Riparian areas along intermittent and running creeks have isolated trees or patches of narrowleaf cottonwood, Scouler willow, and arroyo willow. Distinctive riparian vegetation corridors occur along portions of The Notches, the west side of Johnny Mack Corral, along Bluewater Creek and in the Rice Park area. Understories of some creeks and riparian areas associated with some springs have plants like Nebraska sedge, beaked sedge, baltic rush, tufted hairgrass, spike rushes, monkey flower and Kentucky bluegrass. (Dick-Peddie 1993; Brown 1994; Zeedyk 1996). (USDA, 2000). Cottonwood Canyon and Bluewater Creek are lined with streamers of riparian vegetation. Aqua Remora, an eligible Wild and Scenic River, occurs in the area.

Past Visual Impacts

The ponderosa pine forest here experienced extensive railroad logging during the early part of this century. Favorable topography and a relatively continuous pine forest facilitated a heavy and widespread tree harvest during that time. This area has experienced additional harvest entries since the railroad logging days, but tractor logging has been the primary means of removal (Tidwell 1996). Railroad logging, wildlife habitat improvement projects including prescribed fire, fuel reduction projects with prescribed fire, and unauthorized fuelwood gathering have impacted the landscape, creating the current vegetative mosaic. Fires suppression has contributed to a loss of seral stage development in the forest canopy leading to a more mature forest and openings are being encroached with trees. Some understories are being lost to thickening of stands of vegetation.

The area was overgrazed in the late 1800's prior to being managed as Forest Service lands. However, in response to the increased demand for meat and wool during World War I and II Congress directed the Forest to quadruple stocking rates. Conditions were so deteriorated in some areas that recovery didn't begin until sometime in the 1950 -1960's.

Environmental Consequences

The evaluation criteria for direct and indirect effects to scenic resources will be based on an evaluation of the following:

- Immediate scenic effects of project activities
- Whether VQOs are being met throughout the project area

Analysis is evaluated on the basis that the project area is most often viewed at distances of 300 feet (immediate foreground) from high use travelways and developed sites, where scenery is dominated by the forest canopy and understory.

Analysis of effects assumes the implementation of the scenery design features and mitigation measures are incorporated in all action alternatives.

Alternative A – No Action

The VQOs of the project area would continue to be met under the No Action alternative due to no alterations caused by the project activities, and the existing landscape character would continue to change gradually over time by natural processes. However, visual quality within the project area would continue to decline over time. The desired landscape character would likely not be achieved without the intervention of human activities or natural forces such as fire. Further, there would be no opportunities to enhance and improve the scenic quality along high use roads, trails, and developed recreation sites under this alternative since there will be no thinning or other treatments.

If no fuels treatments occur, the project area would continue to be vulnerable to the threat of high severity wildfire. If such a fire were to occur, the VQOs of the project area would be met, because fire is considered a natural part of the ecosystem. However, the current state of the project area is such that if a high intensity wildfire took place, the fire would reshape the existing landscape character. Existing landscape character and desired landscape character would not be met until vegetation fully recovered. The appearance and character of the area would shift from densely forested to patchy and open, depending on the severity of the fire. For several years, the landscape would be dominated by blackened, dead and downed trees; if allowed to come down on their own, the trees would likely fall in a dense, jack-straw pattern. These changes would be visible throughout the project area in the foreground, middleground, and background of the project areas' roads, trails, and developed recreation sites. The effects would also have limited visibility as background features from areas outside the project area such as from I-40.

Initial public reaction to a fire may be negative, as many people do not consider a catastrophic, stand-replacing fire with its extensive, blackened landscapes to be natural appearing. These effects are often perceived by forest visitors as interesting but as a degradation of the scenic quality nonetheless. In addition, emergency fire suppression actions such as fire lines and emergency post-fire treatments could result in unnatural appearing scars on the landscape. With proper mitigation measures, the effects of the suppression and emergency treatments would not be evident to the casual forest visitor within one to two years of completion, although effects from the fire itself would remain visible far longer. Within two or three years, public perception would begin to change and the effects of the fire would be viewed in a more positive light as the

understory component of grasses and shrubs moved in and as aspen regenerated. Opportunities for scenic viewing, particularly during fall color, would increase and improve with aspen regeneration; however, it would take several years to be realized.

Alternative B

Proposed mitigations are intended to reduce impacts to the scenery resource and ensure the project meets or exceeds VQOs at the end of implementation. The VQOs of retention, partial retention, modification, and maximum modification located throughout the project area would be met with the implementation of this alternative with the integration of the scenery mitigation measures, particularly as conditions moved toward the desired landscape character. Overall, the scenic quality would improve as the diversity of tree species, size, and spatial distribution increased. Generally speaking, as a result of this alternative, viewers would see a more open landscape, an increase in sunlight to the forest understory, and a greater visual penetration into the understory as a result of the proposed activities. Thinning trees along NM 400 and County Road 50 would have a positive effect on the scenic quality as views to the Hogback, McKenzie Ridge, and Oso Ridge are opened up and enhanced.

Mechanical Treatment

The proposed action calls for machine and hand piling and prescribed burns following mechanical treatment. Mechanical treatments include, but are not limited to: use of chainsaws or feller-bunchers to cut trees and lop slash, skidders to move material to landings, bulldozers to pile slash, and specialized equipment such as feller-buncher or track-type hot saws, and tree shears to cut, chop, break, and lop fuel material. Some areas would be hand-thinned using chainsaws only due to resource concerns such as sensitive soils. In these areas, slash would be hand piled without the use of heavy machinery.

There would be a slight to moderate effect on scenic quality during and immediately following implementation of these treatment methods (1-3 years for mechanical treatment). If used, the track-type hot saw would have less ground impacts than other equipment since it sits in one spot to operate. Where this equipment has been used on other projects, typically stumps are cut flush unless prevented by rocks or other natural features.

The presence of skid trails, landings, temporary roads, stumps, and piled or scattered slash would also result in a moderate reduction of the scenic quality for the duration of the project. The effects in these areas would not be long-term since skid trails and temporary roads would be rehabilitated and activity generated slash would be removed upon completion of the project. Additionally, if scenery mitigation measures are incorporated there will be minimal effects as activities will avoid the 300 ft. immediate foreground surrounding roads, trails, and recreation sites. In areas using machine piling (the majority of the total project area), large machine piled slash would be visible at landings immediately following thinning. Until piles are removed or burned, piles would dominate the scenery at the landings.

Machine piling also often leads to surface disturbance and destruction of ground covers. Disturbed ground cover would also appear visually evident to the casual observer traveling along high use roads and trails. The ground disturbance resulting from using machines to pile slash would be noticeable for at least 1 year after project completion, depending on how quickly the areas were rehabilitated and vegetation regenerated. Proposed mitigations such as avoiding placing landings and temporary roads in the immediate foreground of high use areas, immediate rehabilitation of any disturbances to system trails, flush-cut to low stump heights, and prompt treatment of slash ensure that treatments meet VQOs following project implementation. Forest Plan direction requires slash to be treated in Retention and Partial Retention areas, so VQOs will be met in the short and long-term.

Where generated product is left for public fuelwood removal, there will be a short-term impact to visual quality due to the lop and scatter material visible. If mitigations are incorporated and this material is placed outside of the 300ft immediate foreground, impacts to scenery would be minimal. Additionally, any effects would be resolved once fuelwood gathering occurs, which is anticipated to occur shortly after project completion. Once these materials are removed, the VQOs would be met.

Over time, these treatments would result in stands appearing slightly more open and more diverse over time when compared to the existing condition, although the difference may not be noticeable to the casual forest visitor, particularly when driving along the roads. The resulting forest structure would be clumpy groupy, with openings and uneven-aged managements with a reduction in canopy cover, meeting overall desired scenery characteristics. These would be positive effects on scenery.

The impact to scenery during implementation would be minimal as hand thinning produces smaller piles than mechanical treatment would. Mitigation measures ensure that slash piles would be pulled 300' back from the immediate foreground where possible, and that the slash would be burned promptly. Some post-burn effects may be visible, but would be localized and would recover in 3-8 years.

Hand thinning

The impact to scenery during implementation would be minimal as hand thinning produces smaller piles than mechanical treatment would. Mitigation measures ensure that slash piles would be pulled 300' back from the immediate foreground where possible, and that the slash would be burned promptly. Some post-burn effects may be visible, but would be localized and would recover in 3-8 years.

Fuelwood Removal

Where vehicles will be used to access the harvested trees for fuelwood there may be some ground disturbance. In the immediate foreground this appears as disrupted forest litter (fallen

needles, leaves and other natural debris) and exposed soil, which is often lighter in appearance to the surrounding area. During the period where trees are being cut and removed, residual slash will be visible. This would give a coarse textural quality to the ground, until ground cover has been established. It is anticipated that within five years, the color contrast created by the ground disturbance will be reduced as normal forest litter is deposited and ground cover has been established.

Prescribed Fire Treatment

Initial Burn

Prescribed fire would result in short-term, moderate reduction in scenic quality. Depending on fire severity, short-term visual distractions would include smoke, burn scars, blackened or scorched understory, burnt soil, and dead and dying vegetation from the prescribed burn. Prescribed burning has potential to occur throughout the calendar year, dependent on moisture conditions of fuels and weather patterns. Surrounding communities and recreation visitors may be impacted by smoke from burning activities, depending on wind and ventilation conditions. Short-term impacts of smoke are lack of visibility and obscuring of scenery, and are temporary. Smoke from a prescribed burn occurs only for the duration of the burn, and the smoke produced from a prescribed burn results in low intensity smoke that dissipates into the atmosphere. Comparatively, smoke from a high-intensity wildfire can heavily impact an area's air quality and visibility for weeks and months.

Over the long term, use of prescribed fire and other treatments identified in the project would result in a more varied forest structure with desirable visual characteristics such as open park-like stands, views into the forest, and species diversity.

Pile burn

This management prescription would occur prior to initial entry prescribed burning as a method for removing slash produced from thinning activities. This clean-up burn is essential for improving the aesthetic acceptability of these areas. The burned area following initial burns of slash piles would not recover immediately; it often takes 3-8 years for native vegetation to become established due to some soil sterilization following burning. Following burning, small amounts of blackened, partially burned materials would still be visible, and some trees near the burned piles are expected to be singed. There would be small pocked areas of tree mortality resulting from tree singe adjacent to some piles. When all slash piles have been treated through burning, all residual material has been removed after pile burning, and vegetation within disturbed ground areas has begun to reestablish, VQOs would be met.

In the long-term, these treatments would lead the project area to the desired conditions for scenery, creating a more visually acceptable forest stand and improvements to species composition and diversity that is overall compatible with desired scenic character.

Maintenance burn

Maintenance burns would take place to mimic natural return intervals every 2-10 years depending on fuel accumulations. The low to moderate intensity maintenance burns would result in the consumption of surface litter, logs and mortality of small groups of trees. Smoke would be visible during the burning operations. Post burning, blackened soil, trunks, dead or dying vegetation, or partially burned slash, dead and downed trees would be visible. The maintenance burn would promote a more open understory, a preferred landscape aesthetic. Following prescribed burning, the understory grass and shrub vegetation would become noticeable after one to two growing seasons. Long term improvements in soil and vegetation health would encourage a more sustainable stand of forest allowing for improved visual qualities.

Roads and Improvements

Existing roads would be used to the extent possible for hauling harvested trees. Any temporary roads created for the project would not be added to the forest transportation system and would be decommissioned after project was completed.

During road construction, vegetation would be cleared and pruned to accommodate trucks and other equipment, the road prism would be defined and surfaced with aggregate, and drainage features (e.g. rock-lined low water crossings) would be installed. Upon completion of the project, these temporary roads would be recontoured, ripped and reseeded, returning them to their original condition to the extent feasible. Effects associated with constructing these temporary roads would be very noticeable throughout the duration of the project in the immediate foreground and would diminish after the roads were decommissioned. The overall effect on the scenic quality would be slight to moderate.

In addition, this project is proposing to decommission up to 200 miles of unauthorized roads. This would improve scenic quality in the immediate areas, and would slightly improve the scenic integrity in the area.

High Viewpoints

Some of the proposed treatments may be visible during the short-term, project implementation period from surrounding high viewpoints such as McGaffey Lookout. Those treatments visible from this perspective may include prescribed burns and associated smoke, temp roads and landings, but are all short-term and would be visible only during project implementation. Long-term effects of the Proposed Action would increase scenic quality as viewed from long distances at high elevations; forest would appear more open with varied structure and density.

Aspen, Meadow, and Spring Restoration

In areas where meadows and springs are restored, this treatment would produce the significant result of moving these areas to desired scenic quality, by reintroducing a valued scenic element back into the landscape and sustaining it over time.

Fencing could be a method of aspen treatment to exclude elk from aspen and oak regeneration. There would be a slight, localized visual impact from the fence line while it is in place. This impact would be offset by the restoration of the aspens, an important visual element of the desired landscape character description. Following treatment, aspen would be visible to forest visitors, providing year-round texture and color interest for fall foliage viewing.

Fencing may be constructed to protect springs and deter ungulates, encourage riparian vegetation growth, and protect the quality of the spring. Water would be released to restore and recreate the riparian area, providing new habitat for wildlife. There would be a slight, localized visual impact from the fence line while it is in place; however mitigation measures ensure that VQOs would be met and to ensure stability of scenic quality. This proposed action would have the added benefit of enhancing scenic quality around the springs in the long term, as the restored water features would provide increased wildlife viewing and overall scenic interest.

Conclusion

The proposed action would result in a forest that more closely reflects the natural range of variability and desired conditions for scenery. Scenic quality would be enhanced as the diversity of tree species, size, and spatial distribution increased. Throughout much of the project area, stand density would be reduced. The views along major use roads would be more diverse. Visitors traveling along these corridors would experience a sequence of enclosures and openings that add variety and afford more expansive views into the project area. Natural meadows would be restored and aspen stands protected, which would increase visual diversity and place more emphasis on these valued scenic features. Stands would feature clumped, uneven-aged groups interspersed with openings. The understory component of shrubs, grasses and forbs would develop and respond to the open canopy conditions, further increasing visual diversity. Overall, scenic interest and resources would be improved in the project area through implementation of the proposed action treatments.

Cumulative Effects

Cumulative effects in the project area include past, present, and foreseeable future timber harvesting, prescribed burning, road reconstruction, recreational use, and grazing. Any change to the visual resource from these alternatives would be in addition to past harvests and this analysis includes all past and present effects.

Timber Harvesting Activities

Past timber harvesting has occurred in the project area. This past timber harvesting can be viewed from the main roads and trails within the project area. This past harvesting activity is reflected in the existing Moderate scenic integrity of the area. By improving the health of the forests within the project area through reduction of existing vegetation density, this alternative would combine cumulatively with other restoration projects past, present, and future within the immediate project area in reducing the threat of catastrophic wildfire. The reduction of existing

vegetation density from these restoration projects would result in the long term in a forest structure closer to desired conditions for scenery.

Road Maintenance

Open forest roads in the project area would continue to be maintained into the future. These activities include improving road and surface drainage, clearing of roadside vegetation, and repair and maintenance of culverts. Visual effects of this type of work are short-term (less than 5 years) and often go unnoticed by forest visitors.

Recreation

The analysis area has been impacted, in the past, to some degree by various past, present, and reasonable foreseeable future actions listed in Appendix B. Activities include timber harvest prescribed burns, livestock grazing, road maintenance, and implementation of Zuni Mountain Trail Project (ZMTP).

A temporal and spatial bounding overlap analysis was used to determine the cumulative effects. Spatial data is not available for the prescribed burn activities therefore no spatial overlap was analyzed. There are no temporal overlaps with past timber and prescribed burn activities but there are temporal overlaps with grazing, road maintenance, and ZMTP implementation.

There are spatial overlap with past timber activities with timber harvesting activities with portions of motorized trail 2302, portions of non-motorized trails 2001, 2006, 2007, 2009, 2010, 2012, 2013, 2014, 2015, and developed recreation sites; Quaking Aspen and Hilso Trailhead.

There are no cumulative effects to the Developed Recreation Resources from grazing, prescribed fires, and road maintenance. Even though livestock grazing occurs during the summer season, livestock are not permitted within the recreation sites. Prescribed fires have occurred more than 10 years in the past and considered to be outside the temporal bounding for cumulative effects. Road maintenance effects are limited to the road prism

There are no cumulative effects to recreation opportunities and displacement from livestock grazing or road maintenance because dispersed recreation opportunities would not be interrupted despite some temporal and spatial overlap. Road maintenance occurring where the non-motorized trails intersect system roads generally takes less than an hour to complete. The incremental contributions from the past, present, and foreseeable future projects will not exceed the threshold for develop and dispersed recreation resources.

Forest Plan Revision and Update to Scenery Management System

As the Cibola National Forest Land and Resource Management Plan revision is completed and implemented, the Visual Management System would be updated to the Scenery Management System, which focuses more on existing and desired scenic integrity and landscape character. All Forest projects undertaken by the Forest Service in the future would consider scenery, and would

intend to move forest landscapes to desired conditions, desired landscape characters, and scenic integrity objectives, therefore having a beneficial impact on scenic resources.

3.8 Transportation

Affected Environment

There are 151.7 miles of National Forest System (NFS) roads (system roads) in the analysis area. When referring to the route number of a system road, the acronym NFSR is often used. Table 3.8.1 displays the NFS road miles in the analysis area by maintenance level (ML).

Table 3.8.1. Road Miles by Maintenance Level

Maintenance Level	Length (miles)
1	11.2
2	132.4
3	8.1
Total	151.7

The Forest Service uses five maintenance levels: ML 1 to ML 5. An ML 1 road requires the least amount of maintenance effort and an ML 5, the greatest. There are no ML 5 roads in the analysis area. ML 1 roads are closed to all motorized traffic for periods exceeding one year. ML 2 roads are maintained for high clearance vehicles. These are typically single lane roads with a native material surface and limited turnouts. ML 3 and 4 roads are maintained for standard passenger cars and generally provide for a greater degree of driver comfort. ML 3 roads typically have a gravel surface, while ML 4 roads can be surfaced with either gravel or asphalt. Complete descriptions of the road MLs can be found in the Transportation Specialist Report.

In addition to the system roads, there are approximately 187 miles of unauthorized routes that exist in the analysis area. The term unauthorized route can be defined as:

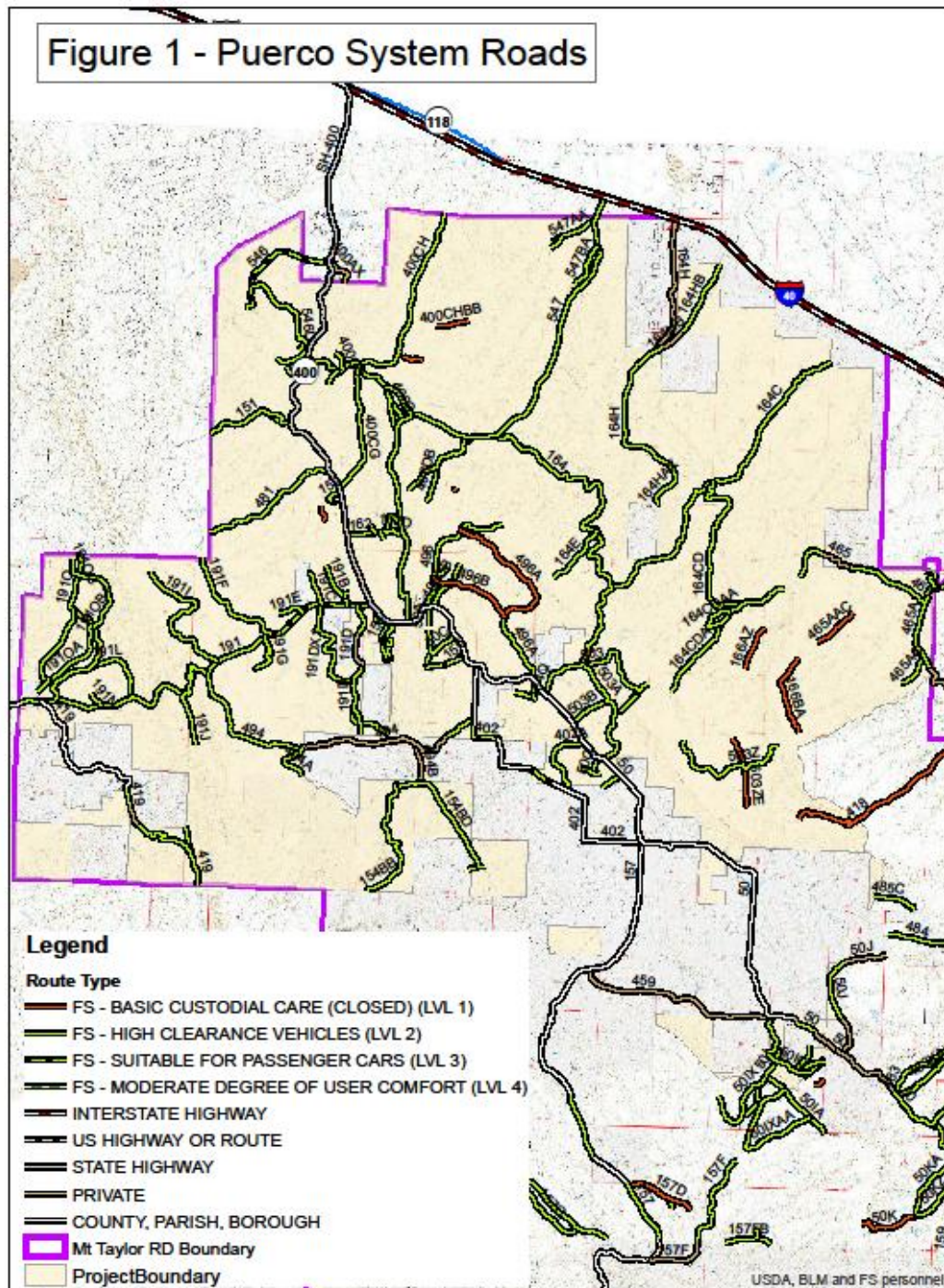
- a road or trail that was created by repeated off-road travel along the same path, without the knowledge and approval of the Forest Service, or
- A temporary road constructed by the Forest Service for a particular project that was planned for, but not decommissioned/rehabilitated when it was no longer needed.

Some of the unauthorized roads adversely affect the surrounding environment through degradation of wildlife habitat, vegetation or soil productivity, interruption of natural hydrologic processes, or disturbance to archeological sites. They also provide access for illegal wood product removal activities.

Figure 3.8.1 shows the motor vehicle designations for the system roads in the analysis area. These designations resulted from the Mt Taylor Ranger District Travel Management decision

signed in 2011. There are 23.4 miles of unauthorized roads that were designated for motor vehicles under the Travel Management decision. The designation of these roads is pending archaeological clearance.

Figure 3.8.1. National Forest System Roads in the Puerco Project



Environmental Consequences

Alternative A

Because no activities would be proposed under this alternative, road maintenance would be accomplished only as funding allows and priorities dictate. The road maintenance budget for the Cibola National Forest has decreased substantially over the last several years. As a result, annual road maintenance has not been accomplished on many of the roads in the analysis area for some time.

Alternative B

No new roads, permanent or temporary, would be constructed for this project. All wood products generated from project activities would be removed from NFS lands using NFS roads, motorized NFS trails and unauthorized road. Unauthorized roads are not system roads. All unauthorized roads used for project activities would be decommissioned when they are no longer needed for these activities, as funding allows.

For roads located on flat or gentle terrain, decommissioning treatments typically consist of decompacting the road surface, seeding the disturbed soil, and spreading slash over the seeded area to retain moisture and eliminate motorized traffic on the disturbed surface. Additional treatments are sometimes required if the road has a steep grade or is located on a side slope. For a road with a steep grade, water bars may need to be constructed to divert runoff from the road surface at intervals sufficient to prevent rutting of the surface during rain events. For a road segment located on a side slope, runoff patterns are restored to as near natural as practicable by pulling the fill material up and blending it with the natural ground. This treatment is generally referred to as recontouring.

A seasonal restriction (Appendix C) for wildlife habitat protection is in place for a portion of the analysis area. The roads or road segments located within the restriction area are closed to the public between December 15th and March 30th.

ML 1 roads used for project activities would be changed to ML 2 during implementation. When no longer needed for project activities, these roads would be returned to ML 1 status, unless they were designated for motor vehicle use under the 2011 Travel Management decision. All unauthorized road used for project activities would be decommissioned/rehabilitated when no longer needed, unless they were designated for motor vehicle use under the 2011 Travel Management decision.

Use of most of the primary proposed haul routes is restricted in some way, or the road would need a moderate-to-substantial amount of work prior to use with commercial hauling vehicles.

Puerco Collaborative Forest Landscape Restoration Project
3. Environmental Consequences

There are segments of NFSRs 50, 164C, 164H, 166 and 464 with no Forest Service right-of-way (Table 3.8.2). Easements, or some other form of permission, would have to be acquired from the land owners prior to use for project activities.

Table 3.8.2. Road Access Concerns.

Route No.	Location (T,R,S)	Comments
154BB	13N,16W,22,23	No apparent legal access to this road.
154BC	13N,16W,22,23	No apparent legal access to this road.
154BD	13N,16W,22,23	No apparent legal access to this road or across private.
164C	14N,15W,12,13	FS easement across private at north end but encountered locked gate during field visit.
164H	14N,15W,16	Segment through state land with no apparent FS easement.
164HB	14N,15W,16	Segment through state land with no apparent FS easement.
166	14N,14W,28,32	No FS easement for private at north end.
191D	13N,16W,9	No FS easement across private.
402A	13N,15W,30	No apparent legal access to this road.
459A	12N,15W,7,8,17	No apparent legal access to this road.
464	14N,14W,28,32	Segments through State and private land with no apparent FS easement.
465	13N,14W, 5; 14N,15W,36	No FS easement across private.
494	13N,16W,21,22,23	No FS easement across private.
494B	13N,16W,23	No FS easement across private.
50	11N,13W,18,19; 12N,14W,19,20,28,29,33	Easements needed for six separate segments.
50I	12N,15W,10; 12N,15W,15	No FS easement across private (3 segments).
50IC	12N,15W,10; 12N,15W,15	No apparent legal access to this road because of access concern on NFSR 50I.
50ICA	12N,15W,10; 12N,15W,15	No apparent legal access to this road because of access concern on NFSR 50I.
50ICB	12N,15W,10; 12N,15W,15	No apparent legal access to this road because of access concern on NFSR 50I.
50J	12N,15W,13	Private segment south to NFSR 50 with no apparent FS easement. Also, not sure if 50 there is county road (county road layer doesn't show as their road).
NM-400		Bridge #4186 has a posted load limit of 17 tons for 2-axle truck, 22 tons for 3-axle truck, or 38 tons for 5-axle truck.

There is a timber bridge on NM-400 with a reduced load rating because of its deficient condition. The bridge is located approximately 1.7 miles south of Interstate 40 and crosses the Rio Puerco. The load limit for the bridge is 17 tons for trucks configured with 2 axles, 22 tons for 3 axles, and 38 tons for 5 axles.

Most of the potential haul routes would require nothing more than routine maintenance. Several of the potential primary haul routes would require substantially more than what could be

considered as routine maintenance. The following is a summary of the additional work that would be required for some on these haul routes:

- NFSR 547 would need extensive drainage and surface erosion repair prior to use with commercial hauling vehicles, primarily along the northern seven miles, through Six Mile Canyon. There are several culverts that are undersized and would need to be replaced with larger culverts. Roadside drainage would need to be reestablished in spots, and the road template would need to be repaired at several locations.
- Much of NFSR 50 is located in a valley bottom. The road has poor drainage and has not been maintained in many years because of the inability to acquire easements for many of the private segments along the road. Substantial road template and drainage reconstruction work would need to be completed prior to use by commercial hauling vehicles.
- Portions of NFSR 164C, 164H and 164HB would require a substantial amount of surface and drainage reconstruction work. This work may include raising the road surface and adding drainage features.
- Forest Road (FR) 166 is a previously decommissioned road. Portions of this road would require a substantial amount of surface and drainage reconstruction work. This work may include raising the road surface and adding drainage features.

There are three National Forest System trails (NFST) in the analysis area: 2301, 2302 and 2303. The last 2.7 mile segment of NFSR 191J was converted to motorized trail (NFST 2301) under the Travel Management decision. Use with full size vehicles is prohibited on this segment. There is an unauthorized road identified as a potential haul route that would not be accessible without access on 191J.

The first 2.7 mile segment of NFSR 496A and all of NFSR 496B were designated as motorized trail under the Travel Management decision. This road and road segment are considered shared features. They maintain their status as National Forest System road but were added to the trail system as NFST 2302. While designated as a NFS trail, use with full size vehicles on these routes is prohibited. The motor vehicle designation would have to be changed to use these routes as access to treatment areas.

The vast majority of the potential haul routes are native surface roads and are not suitable for use when wet.

Cumulative Effects

There are no anticipated cumulative effects resulting from the combination of the proposed activities related to this project and any ongoing or reasonably foreseeable future projects.

3.9 *Heritage Resources*

Tribal Consultation

The Cibola National Forest consults with seven American Indian Tribes and 13 Chapters of the Navajo Nation regarding proposed projects and management activities on the Mt. Taylor Ranger District. These include: the Hopi Tribe, the Navajo Nation, and the Pueblos of Acoma, Laguna, Zuni, Jemez, and Santa Ana and the following Navajo chapters: Baca/Prewitt, Casamero Lake, Crownpoint, Mariano Lake, Ojo Encino, Ramah, Smith Lake, Thoreau, To'hajiilee, Torreon, Whitehorse Lake. In 2016, the Forest began consulting with the Baahaali and Churchrock Chapters.

Consultation pursuant to Section 106 of the National Historic Preservation Act was initiated in 2013. The Puerco Landscape Restoration project was highlighted in the Forest's annual project consultation letter sent to the Tribes and Chapters in 2013, and again in 2014 and 2015. Project consultation meetings were initiated in the summer of 2013 and have continued into 2018. The Cibola National Forest has received additional comments during project consultation and other meetings.

The Zuni Mountains are regarded as culturally significant by all the Tribes consulted, and are used on an ongoing basis by most for a variety of traditional activities. All the Tribes regard springs and other natural water sources as significant, culturally and ecologically.

Navajo traditional use of the Zuni Mountains is widespread. Based on past consultation with the Navajo Nation Historic Preservation Department, several geographic landforms of cultural significance and areas of traditional use have been identified in the Zuni Mountains, a few of which are located within the Puerco project area. In addition, over the past several years, cultural items thought to be Navajo in origin have been discovered during archaeological inventory for this project; all are located in treatment areas where prescribed burning and/or vegetation treatment is proposed.

The Pueblo of Laguna has acknowledged its use of the Zuni Mountains for traditional activities, however those activities appear to be focused in the eastern portion of the Zuni Mountains, outside of the project boundary. The Pueblo has stressed the importance of retaining and protecting Douglas fir due to its ongoing use in ceremonial activities.

The Pueblo of Zuni has indicated that its key areas of concern involve springs, watershed health, erosion, sedimentation, and water for the Zuni Bluehead sucker. Under a partnership between the Forest Service and the Zuni Cultural Resource Enterprise, Zuni Pueblo's Cultural Resource Advisory Team is preparing to conduct a cultural inventory at several springs within the Puerco project area in anticipation that restoration at some of the springs will be accomplished as part of project implementation.

To date, the Pueblos of Acoma and Jemez have not provided any specific comments or expressed any concerns regarding the Puerco project. The Pueblo of Santa Ana has indicated it does not have any concerns or comments about the Puerco project.

To date, no Tribe has expressed concern that the forest restoration treatments being proposed will have an impact upon culturally significant sites or traditional practices. Those Tribes that are engaged in the Zuni Mountain Collaborative Forest Landscape Restoration partnership (CFLRP) have participated in aspects of the data collection and planning process for this project, and have expressed support for the agency's forest restoration efforts. Some treatments may result in improved opportunities for the collection of forest products, including fuelwood.

Affected Environment

Cultural resources represent the tangible and intangible evidence of human behavior and past human occupation. They may consist of archaeological sites, historic-age buildings and structures, traditional use areas and cultural places that are important to a group's traditional beliefs, religion or cultural practices. The following discussion provides information on contemporary Native American uses, documentation of tribal consultation, and a summary of archaeological sites within the area of potential effect.

The types of archaeological sites previously located within the Puerco Analysis Area have been divided into 12 general archaeological site type categories outlined below. Many of these sites have been previously evaluated for eligibility into the National Register of Historic Places. Many of the sites with unknown temporal affiliation are lithic scatters with no diagnostic material. The sites found in the project also area vary in size and function. Sites range from low intensity use areas, small-large residential structures, pictographs, mining features, and homesteads.

Lithic scatter: Surface scatter of cultural artifacts and debris that consists entirely of lithic (i.e., stone) tools and chipped stone debris, but which may also contain other or additional artifact types such as pottery or bone artifacts, to a camp which contains habitation features, such as hearths, storage features or occupation features, or to other site types that contain different artifacts or features.

Ceramic Scatter: Surface scatter of cultural artifacts and debris that consists entirely of ceramic sherds and fragments of ceramic vessels. This is a common prehistoric site type that is contrasted to a cultural material scatter, which contains other or additional artifact types such as lithic or bone artifacts, to a camp which contains habitation features, such as hearths, storage features or occupation features, or to other site types that contain different artifacts or features.

Corral/Animal Pens: Historic Log or brush enclosures used to confine livestock.

Mineral Extraction Site: Locations where mineral resources were either mined or dug from its natural source. In the past, the Zuni people extracted turquoise and azurite from sources in the

Zuni Mountains. Historically, mines looking for copper, silver, and fluorspar have been dug within the Zuni Mountains.

Peeled Trees: Culturally modified trees, typically ponderosa pine, used for sustenance, culinary, and medicinal purposes.

Railroads: Transportation Railroad logging was once very prevalent in the Zuni Mountains and many remnants such as railroad grades, trestles, and crossings remain.

Rock Art: Images or symbols carved, drawn, or painted onto immovable rock surfaces. Images that are carved or engraved into rock are called petroglyphs. Images made with paint or other pigment are referred to as pictographs. Some rock art images, like painted petroglyphs, were created using a combination of techniques.

Rock Shelters: Shelter bluffs or stone overhangs used or occupied by people in the past.

Stone structures: Contact or precontact structures or buildings constructed of stone and or masonry. Precontact structures are typically roomblocks and foundations, historical structures may be home or farmsteads, or associated with mining or logging.

Traditional Cultural Properties

There are six categories of features that may also be TCP's

- Springs
- Trails
- Shrines
- Offering places
- Cairns
- Tinajas

Of these potential TCP feature types, only the vegetation around springs is likely to be affected by the proposed project activities.

Water Control Features: Stone or wooden features used to channelize or divert stream flow.

Wooden Structures: Structures built or constructed from wooden components. These may range from forked-stick hogans, log cabins and historical structures, to sawmill remnants.

Environmental Consequences

Under the regulations, an adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a cultural resource that qualify the property for inclusion

in the National Register. Consideration shall be given to all qualifying characteristics of a historic property, including those that may have been identified subsequent to the original evaluation of the property's eligibility for the National Register. Adverse effects may include reasonably foreseeable effects caused by the undertaking that may occur later in time, be farther removed in distance or be cumulative. Specific examples of adverse effects cited in statute include (36 CFR 800.5):

- Physical destruction of or damage to all or part of the property.
- Removal of the property from its historic location.
- Change of the character of the property's use or of physical features within the property's setting that contribute to its historic significance.
- Introduction of visual, atmospheric or audible elements that diminish the integrity of the property's significant historic features.

Impacts to cultural resources, especially archeological sites, can be generally defined as anything that results in the removal of, displacement of, or damage to artifacts, features, and/or stratigraphic deposits of cultural material. In the case of traditional cultural properties and sacred places, additional considerations may include alterations that would affect the character and use of the location, and/or presence and availability of a specific traditionally used natural resource.

Alternative A: No Action Alternative

Under the 'No Action Alternative' the current conditions of the Puerco Analysis Area would remain the same. There would not be any direct impacts to heritage resources and sites would only be exposed to the customary and natural threats, such as weathering, erosion, and exposure to the elements. Indirect effects of the "No Action" alternative include an expected buildup of fuels, which will lead to more intense wildfire behavior. This may cause increased damage to fire sensitive archaeological sites exposed to the sustained, intense heat from wildfires.

Alternative B: Proposed Action Alternative

Mechanical and Manual Vegetation Treatments:

The removal of trees will reduce long-term fuel continuity, fuel loading, and fire hazard. This type of treatment will benefit cultural resources within the project area by decreasing the potential for adverse effects caused from high intensity, high severity wildfires. If the mitigation measures discussed in Chapter 2 are followed, the proposed mechanical and manual vegetation treatments should have no negative direct effects on listed, eligible and unevaluated cultural resources.

There is some potential for negative indirect effects of vegetation treatments on cultural resources. Increased erosion following initial treatments may result from loss of ground cover and soil disturbance from vehicle use (during mechanical treatments and fuelwood cutting). There have been few post-treatment studies (if any) that monitor the effects of large scale

vegetation treatments on archaeological sites. Because many of the sites are susceptible to erosion (85 of the 118 sites discussed in the ‘Previous Impacts’ section above), there is some potential for vegetation treatments to increase the amount of erosion across the surface of the site (at least initially – prior to ground cover regeneration). Data from the Cibola National Forest corporate geodatabase indicates that there is a significant amount of ground in the project that lies within areas with soil conditions susceptible to severe erosion impacts. The Proposed Action Alternatives B and C have, however, eliminated these areas from being harvested for timber or fuelwood. While effects from erosion due to mechanical and manual treatments may not be significant, an attempt should be made to monitor sites for erosion impacts following treatments. In addition to erosion, increased site visibility caused by removal of vegetation can substantially increase inadvertent or advertent looting activities.

Prescribed Fire:

The use of prescribed fire may have some direct impacts on archaeological sites. These include but are not limited to, the re-firing of ceramic material, melting obsidian artifacts, and the accelerated erosion of site features caused by hydrophobic soils denuding of the ground surface and exposing cultural materials. Sites that are either combustible or include combustible cultural material are the most vulnerable to fire because archaeological material can be completely consumed during a fire event. Although unpredictable creeping and spread of prescribed fires have the potential to damage fire sensitive cultural material, proper mitigation and consultation between the fire management staff and forest service archaeologists will decrease the likelihood of negative direct effects to cultural resources.

The indirect impacts of fire on archaeological sites often have more lasting effects than the direct impacts. Increased site visibility caused by removal of vegetation can substantially increase inadvertent or advertent looting activities. The biggest indirect impact of prescribed fire to site condition, however, is due to increased erosion from loss of ground cover (North et al 2003). Data from the Cibola National Forest corporate geodatabase indicates that there is a significant amount of ground in the project that lies within areas with soil conditions susceptible to severe erosion impacts. The Proposed Action, Alternative B, however, eliminated these areas from being harvested for timber or fuelwood. The only proposed prescriptions in areas with severe soil conditions are prescribed burn treatments. There are 65 sites that are located within project areas with severe soil conditions. Prescribed burn treatments may have some effect on sites in these areas that are susceptible to erosion, but the effect *may* be negligible. An attempt should be made to monitor sites for erosion impacts following treatments. A catastrophic fire, however, would undoubtedly have more indirect impacts on cultural material than a broadcast burn.

Cumulative Effects

The cumulative effects on cultural resources should take into account all surface-altering actions that have occurred or are likely to occur within the Puerco Analysis Area. As discussed in detail in the ‘Previous Impacts’ section of this report, current and previous Forest Service management

activities, public resource procurement and recreational use and natural processes have impacted cultural resources. However, through the use of standard mitigation measures, these impacts have substantially diminished. Within the Forests, there are other planned or reasonably foreseeable activities that may affect cultural resources. Although many of these activities will coincide with the proposed action, if proper mitigation measures are followed and sites sensitive to erosion and fire are monitored during the prescribed burns, it is not anticipated that the cumulative effects will have a significant impact on heritage resources.

3.10 Range Management

Affected Environment

The table identifies the seven grazing allotments affected and the number of acres to be treated across the landscape. The existing conditions and information on each grazing allotment were obtained from 2210 Allotment Folders.

Table 3.10.1. Puerco Allotments and Proposed Treatments

Allotments	Total Acres of Allotment	Total Acres of Vegetation Treatments	Proposed Range Improvements
Prewitt/6A	39,173	33,289	8
Wingate	28,642	28,378	7
Brennan	3,993	3,650	7
Berger 167	167	167	1
Stinking Springs	6,841	6,739	9
Dent/Dan Valley	19,214	847	0
Cottonwood/Las Tucas	53,869	196	0
Dan Off	5,176	2,067	0

Prewitt/6A Allotment

The management unit is a combination of the old Prewitt and 6A grazing allotments. They were combined and have been managed together as one unit for approximately over 25 years to date. The allotment is located near the western end of the Zuni Mountains, approximately 40 miles west of Grants NM and just south of the gas refinery near Gallup NM. There is a total of 39,173 acres of Forest lands within this allotment. In addition to the Forest lands in the allotment, there are approximately 3,600 acres of private and State leased lands that lie with the allotment boundaries and are used in conjunction with Forest lands.

The current stocking rate for Prewitt/6A is a total of 240 mixed/class cattle and season of use is for a total of five months (1,304 AUMs). There are four pastures – Four Mile, Smith/Foster, Red Rock and Sanchez which is managed under a deferred rotation system. The periods of use and stocking rate are determined each year and written in their Annual Operating Instruction (AOI).

Each pastures are usually grazed during a different time each year, providing for varying season of rest for forage species on the allotment from year to year.

Wingate Allotment

Wingate Allotment is located at the west end of the Zuni Mountains, approximately 14 miles southeast of Gallup.

The Wingate Allotment is currently permitted for 123 mixed class (M/C) cattle for a period of five months normally from May until October, (627 AUMs). Grazing is carried out utilizing a five pasture rotation system. The permittee tries to rotate through each pasture at a different time each year, however; it depends on availability of livestock water. The adaptive livestock practice helped improved distribution of livestock in response to various factors such as forage growth, drought conditions, recreational events, and other unforeseen events.

The stocking rate on the allotment has been steadily reduced over the years until 1980 when the current stocking rate was established. In 1980 or so, Range analyses and Production/Utilization (PU) studies showed a very poor range condition in the early days of Forest management. The condition has improved markedly over the past 30 to 40 years to a fair to good condition rating. This improvement is no doubt due to the adjustment of livestock used to match actual capacity and improving water distribution to promote proper use of the range resources. Water sources on the allotment are earthen tanks, windmill and distributed by pipelines to drinking troughs.

Brannon Allotment

The Brennan Allotment is located between Prewitt/6A and Wingate Allotments in the western portion of the Zuni Mountains, approximately 15 miles southeast of Gallup, New Mexico. There is a total of 3,993 acres of Forest Service lands within this allotment, 2,365 acres of which are classified as “capable” for livestock grazing.

The Brannon Allotment is currently permitted for 40 mixed/class cattle for a period of 6 months each year (05/01 – 10/31). This is a total of 245 AUMs each year. The management plan includes the four pasture, deferred rotation system. Herding and salt placement is used to insure proper livestock distribution and use of the entire allotment.

Each pasture is grazed at a different time each year, providing for varying seasons of rest for forage species on the allotment from year to year. Specific grazing schedules and pasture rotations are outlined each year in the Annual Operating Instructions (AOI).

An intensive allotment inspection was performed on this allotment in August of 2001, in preparation for completing this EA. Grasslands on the allotment were found to be in good to excellent condition, with an upward or static trend. This shows steady improvement over the past 30 years, due to implementation of a proper stocking rate and good management practices.

Stinking Springs Allotment

Stinking Springs Allotment is located south of Gallup NM on the extreme western end of the Zuni Mountains of the Mt. Taylor Ranger District. There are a total of 6,841 acres of Forest lands and capable land are 3,879 acres. It is bordered by Navajo Reservation lands on the west, north by the Army Depot, Zuni Indian Reservation to the south and the Wingate Allotment on the east.

The Stinking Springs Allotment is permitted for 39 head of cow/calf pairs from May 16 to October 15 each year, (207 AUMs). There are three pastures: West, Middle and East. Cattle usually rotate through the pasture depending on available water. The Middle Pasture is the largest and has the most forage production, while the East and West are fairly small due to dense tree cover.

There are two earthen tanks. Navajo dam is partly washed out and should be cleaned out and have the spillway reconstructed with filter cloth and rock on the spillway. Little Bear dam is currently holding water. The fence around the tank is in need of repair. The old corral is made out of wooden pellets and should be removed. The permittee is planning on building a new corral.

In the past, livestock water was provided from Stinking Springs. There is an old fence around the spring which is in bad condition. In the summer of 2016, a new well was drilled above the spring and piped to the storage tank located downstream and to a drinker. Another developed spring, Little Bear Spring is located at the northeastern corner of the allotment and is providing water for livestock and wildlife.

In 1999, the range condition was observed to be mostly in fair. A small portion of the acreage in the southern portion rated poor, but all the grassland type is showing a definite improvement except on the steep slopes and where conifers dominate the vegetation. Forage production was observed to be very good despite a very low snowpack from the winter ranging from 500 pounds to 800 pounds per acre. In the past, utilization was approximately 10% in the West Pasture and ranged from 0% to 15% in the Middle Pasture, and 25% in the northern areas. Re-growth was plentiful when livestock were rotated through the pasture.

Berger Allotment

This management unit is the smallest allotment found on the Mt. Taylor Ranger District. It consists of 187 acres of Forest lands, all of which are classified as “capable” for livestock grazing. It is surrounded by Wingate Allotment near the western boundary of the Mt. Taylor district, in the Zuni Mountains, approximately 15 miles southeast of Gallup, New Mexico.

The allotment is currently permitted for eight mixed/class cattle for a total of four months each year. This is a total of 32 AUMs each year. This small allotment is a one unit with continuous grazing for the four months. Grazing normally occur during the months of May, June, August and September with rest during the month of July. To reflect the adaptive management approach,

the actual grazing period during any specific year has been negotiated between the permittee and the Forest Service.

There is a large earthen tank, known as Prewitt Lake, at the southern end of the allotment. This tank catches large amounts of runoff, and is a relatively consistent source of water for livestock and wildlife in the area.

Livestock have used this area, as well as the whole of the Zuni Mountains, for well over 100 years. Exact usage of this small area is difficult to determine because it was used by different individuals over the years. It was separated out from the surrounding area and used as a special use pasture starting sometime in the 1930's. A portion of this pasture, at the southern end, just north of FR191, was used as a rodeo ground for some time in the 1940's and 1950's. The area was badly damaged by this activity and the vehicle use associated with it. It has taken many years for it to recover.

Cottonwood/Las Tuces Allotment

Cottonwood/Las Tuces Allotment is located in the central portion of the Zuni Mountains, approximately 20 miles northwest of Grant NM. It is the largest allotment on the Mt. Taylor Ranger District, encompassing approximately 53,869 acres.

The stocking rate was steadily reduced over the years to bring livestock numbers and use was balanced with the allotment capacity. The current stocking rate of 292 mixed class (M/C) cattle for 5 months (1,460 AUMs) was established since 1997. Livestock are usually split into two herds of unequal size and each herd uses three of the pastures in a deferred rotation system.

Prior to 1948, much of this area was in private ownership. The Forest Service purchased and/or traded for the private lands in this area during the late 1940's. The Cottonwood Allotment took on its present configuration in 1985 when the Las Tuces Allotment was combined with the Cottonwood Allotment (becoming the Las Tuces Pasture) and the boundaries were firmed up.

There are a number of drainages on the allotment which run water at least intermittently during snowmelt and/or monsoon season. The more prominent of these include Sawyer Creek and Cottonwood Creek. There a number of man-made watering facilities found throughout the allotment, including wells and earthen stock tanks.

Dent/Dan Valley Allotment

Dent/Dan Valley Allotment is one unit located north of Ramah NM. There is a total of 19,214 acres of Forest lands within the allotment, of which 11,420 acres are classified as "capable" for livestock grazing.

The stocking rate and season of use for the Dent/Dan Valley Allotment is 64 mixed/class of cattle for five months each year, a total of 326 AMUs. A deferred rotation system based on forage and water availability is used.

Dan Off Allotment

Dan-Off, a former allotment, is located to the far southwest end of the Zuni Mountain on the Mt. Taylor Ranger District. The total acres of the area is approximately 5,176 acres. The former allotment is bordered to the south by Zuni Indian Reservation and surrounded by the Navajo Tribal Trust Land and Indian Allotments.

Currently, Dan-Off Allotment is a closed allotment and not permitted to anyone. The last authorized livestock grazing was in 1952 according to the 2210 file. There is no boundary fence around Section 34, T13, R12W and other smaller partial of National Forest System land to the north. Landowners have been maintaining fences that border their private land and Section 36. There is an illegal fence construction done along the road leading to the homes on the Navajo Tribal Trust Lands. In the past, it was reported that 150 sheep and goats, 50 head of cattle and horses were seen to be grazing on the areas various times of the year.

In 2012, a productive/utilization survey was conducted in Section 35. The survey revealed the production varied from 100 to 500 lbs. per acre in Map Unit (MU) 11 which is the valley bottoms. Forage utilization by ungulates ranged from 0% to 20.6%.

Environmental Consequences

The following discussion will describe the affects to the seven grazing allotments in relations to vegetation and livestock grazing, and the potential changes to those environments due to proposed Puerco Landscape Restoration projects in each alternative.

Alternative B – Proposed Action

The fuel treatments proposed for the Puerco Landscape Restoration over the next 10 to 15 years would have a varying effects on livestock grazing because the treatments will be done at various times. These treatments are expected to begin in year 2019-2020. Mechanical treatments will occur outside the winter season. In general, the overall effects on the allotments will be beneficial to the rangeland resources that are important for livestock and wildlife grazing.

Where treatments are done, the forage components would increase in production, density, diversity and additional range improvements will be constructed to improve livestock distribution across the allotments. Underutilized rangelands due to dense canopy covers with sparse understory forage and limited livestock watering sources will be improved. Having adequate litter is important for resource protection such as to alleviate quick runoff, prolong erosion and to allow for infiltration of moisture.

Livestock grazing on the seven allotments will continue with livestock grazing with minor adjustment in livestock numbers, season of use and short term grazing deferment in all or portion of the allotment if determined necessary. The actual assessment on the ground will depend on the types of treatment done and will define an alternative management needed to foster the recovery of understory species such as grasses, forbs, shrubs and browsed species, and meet the goals and objectives of the Puerco Landscape Restoration Project. These species are important for livestock and wildlife forage needs.

Prewitt/6A Allotment:

The majority of the northern areas of the Prewitt/6A have sensitive Chinle Formation soils that were reclassified from hand thin, lop and scattering slash and prescribe burning to thinning, lop and scattering and no prescribe burning. This will protect soil conditions and reduce potential erosion. However, the area in and around McKenzie Ridge in the northeastern portion of the project area were reclassified from thinning and prescribe burning to burn only.

Approximately 33,289 (85%) acres would be treated out of the total 39,173 acres of the allotment. These treatments would be spread out over a 10 to 15 year time frame. Livestock can still graze the pastures as thinning, lop and scatter is accomplished. Cattle are found to keep distance away from the treatment area as demonstrated in the Bluewater Restoration treatment areas. When it comes time to burn atop of McKenzie Ridge, livestock grazing may be deferred for a growing season to allow for understory forage to get re-established and make sufficient growth after the burn. The concern here is some of the treatment areas consists of shallow soil over underlying rock. The recovery of understory vegetation may take longer to start new growth.

The Annual Operating Instructions will contain any specific instruction about the grazing rotation, season of use and livestock numbers will be discussed and agreed upon with the grazing permittee.

To improve availability and distribution of water to benefit both range and wildlife species across the Puerco project, the following developments and improvements are proposed:

- A new well in Section 19 south end of Red Rock Pasture. T13N, R15W. Section 19
- Re-drill existing well #021070 in Section 18 of Red Rock Pasture extend pipeline to drinkers.
- Re-drill existing well #22275 (Wildcat well) in Smith Canyon, Section 22.
- New well in private land in Section 17 in Fourmile Pasture. Pipeline will be extended to State land.
- New dirt tank in Fourmile Canyon, Section 30.
- Reconstruct fence #022165 approx. 2.5 mile and #021112, interior fence between Smith/Foster and Four Mile Pastures. Approx. 5 miles
- New cattle guard on fence #021100 in Section 26.
- Redirect wash from old gravel pit. Sediment wash out from Un-reclaimed gravel pit in Section 28 & 29 has become a problem.
- Clean out 8 dirt tanks.

Wingate Allotment:

Approximately 28,378 (99%) acres would be treated out of the total 28,642 acres of the allotment. These treatments would be spread out over a 10 to 15 year time frame. The majority of the treatment on this allotment will include low thin, lop and scatter, no mastication and no burning is proposed on 11,486 acres while thin, commercial removal and burn is proposed on 11,807 acres. This allotment will be most affected by commercial treatments.

The Annual Operating Instruction will contain any specific instruction about the grazing rotation, season of use and livestock numbers will be discussed and agreed upon with the grazing permittee.

To improve availability and distribution of water to benefit both range and wildlife species across the Puerco project, the following developments and improvements are proposed:

- Clean out dirt tank #021026
- A new well is proposed but not located yet
- Erosion control in Six Mile canyon
- New cattle guard in Six Mile canyon, redirect water away.
- New cattle guard at Forest entry on Highway 400 from Wingate.

- Reconstruct/repair Six mile well, re-design, need new storage tank and drinkers.
- Reconstruct north boundary fence along Navajo Reservation, approximately 8 miles.

Brennon Allotment:

Approximately 3,993 (91%) acres would be treated out of the total 3,650 acres of the allotment. These treatments would be spread out over a 10 to 15 year time frame. The majority of the treatments includes thin, commercial removal and burn is proposed on 2,392 acres while thin, lop and scatter or masticate and burn is proposed by 1,075 acres. This allotment will also be most affected by commercial treatments. The Annual Operating Instruction will contain any specific instruction about the grazing rotation, season of use and livestock numbers will be discussed and agreed upon with the grazing permittee.

To improve availability and distribution of water to benefit both range and wildlife species across the Puerco project, the following developments and improvements are proposed:

- Clean out 2 dirt tanks and build up dike at Gravel Tank.
- New dirt tank in Section 16.
- Reconstruct fence #021084.
- Clean and fix culverts on roads.
- Reconstruct corral in Recreation Pasture.
- Close two track road at Gravel Tank.

Stinking Springs Allotment:

Approximately 6,739 (98.5%) acres would be treated out of the total 6,841 acres of the allotment. These treatments would be spread out over a 10 to 15 year time frame. The majority of the treatments includes thin, commercial removal and burn is proposed on 2,981 acres while thin, lop and scatter or masticate and burn is proposed by 2,432 acres. This allotment will be most affected by commercial treatments. Due to machineries, hauling and disturbance on the ground may limit livestock movements.

The Annual Operating Instruction will contain any specific instruction about the grazing rotation, season of use and livestock numbers will be discussed and agreed upon with the grazing permittee.

To improve availability and distribution of water to benefit both range and wildlife species across the Puerco project, the following developments and improvements are proposed:

- Erosion control structures in main drainages, downstream from Little Bear Reservoir, Whitewater Arroyo and downstream from Stinking Springs.
- Reconstruct dirt tank in Section 14.

- Clean out tanks – South tank
- Need to create a trail to get to Grasshopper Spring.
- Clean out cattle guard off FR 191 at the top adjoining Wingate Allotment.
- Extend pipeline to corral and put in a trough in Section 15. Will have to cross the Road 419 going to Garcia Ranch.
- Close/decommission unauthorized road near gap of Hogback with erosion control structures.
- Close/decommission unauthorized roads, newly made by wood cutters.
- Remove old barbed wire fence north of Little Bear Tank.

Berger Allotment:

Looking at the allotment map, approximately 80 (50%) acres would likely be treated out of the total 167 acres of the allotment. The eastern portion of the allotment is open grassland with some encroaching ponderosa saplings and seedlings. These treatments in this small could be done in a couple of years rather than over the 10 to 15 year time frame, depending upon availability of funding and personnel.

Thin, lop and scatter, mastication and burning is proposed on 88 acres while thin, commercial removal and burning is proposed on the remaining acres. This small allotment is a one unit with continuous grazing for the months of May, June, August and September with a rest period in July. This break was planned for monsoon season. During cutting and removal of wood products, cattle are likely to graze in the open meadow. After conducting prescribed burning livestock grazing may be deferred for a growing season to allow for understory forage to get established and make sufficient growth after the burn. If determined that livestock need to be deferred for a longer period then the permittee may have to find alternative pastures and may have an economic impact on him.

The Annual Operating Instruction will contain any specific instruction about the grazing rotation, season of use and livestock numbers will be discussed and agreed upon with the grazing permittee.

To improve availability and distribution of water to benefit both range and wildlife species across the Puerco project, the following developments and improvements are proposed:

- Clean out Prewitt Tank #021028

Dent/Dan Valley Allotment:

Approximately 847 (4.4%) acres would be treated out of the total 19,214 acres of the allotment. These treatments would be spread out over a 10 to 15 year time frame.

The treatment is proposed on the northern edge of the allotment where ponderosa pine mixed stands are abundant. The treatment area is located on the mesa top where livestock grazing is very little to no grazing. Distance from water limits grazing in the northern edge of the allotment. The treatments will have very little effects on livestock grazing.

The Annual Operating Instruction will contain any specific instruction about the grazing rotation, season of use and livestock numbers will be discussed and agreed upon with the grazing permittee. In the immediate area of treatment no water development or improvements were proposed.

Cottonwood/Las Tucas Allotment:

Approximately 196 (0.36%) acres would be treated out of the total 53,869 acres of the allotment. These treatments would be spread out over a 10 to 15 year time frame. Low thin, lop and scatter, no mastication and no burning is proposed on 97 acres while thin, commercial removal and burn is proposed on 95 acres. This small treatment would have no effects on livestock grazing.

The Annual Operating Instruction will contain any specific instruction about the grazing rotation, season of use and livestock numbers will be discussed and agreed upon with the grazing permittee. In the immediate area of treatment no water development or improvements were proposed.

Dan Off:

Of the 5,176 acres, 2,067 (40%) acres is proposed to be treated. Dan Off is a former grazing allotment that is no longer active. The boundary fences have not been maintained. Portions of the former allotment have become an open range utilized by the people residing adjacent to the Forest Service System Lands. Any treatments proposed for the area would not have a direct impact on Forest permitted livestock grazing on the National Forest.

In the immediate area of treatment no water development or improvements were proposed.

Cumulative Effects

The geographical extent of the cumulative effects would include the allotments and the surrounding communities. Past, present and future foreseeable actions on the project areas would have an effect on vegetation resources which includes: livestock grazing, wildlife grazing, recreational activities, and along with past timber sales, timber stand improvement thinning, prescribed burning, wild and domestic grazing, riparian improvements projects, recreation projects development (trails for mountain bike, other motorized) and increase invasive and noxious weeds.

3.11 Socioeconomics

Affected Environment

Environmental Justice

Executive Order (EO) 12898 (Office of the President 1994) directs federal agencies to focus attention on the human health and environmental conditions in minority and low income communities. The purpose of EO 12898 is to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects on minority and low-income populations.

Environmental Justice means that, to the extent practicable and permitted by law, all populations are provided the opportunity to comment before decisions are rendered on, are allowed to share in the benefits of, are not excluded from, and are not affected in a disproportionately high and adverse manner by government programs and activities affecting human health or the environment.

Environmental Justice is the fair treatment and meaningful involvement of people of all races, cultures, and incomes, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. The goal of environmental justice is for Federal agency decision-makers to identify impacts that are disproportionately high and adverse with respect to minority and low income populations and identify alternatives that will avoid or mitigate those impacts.

The emphasis of environmental justice is on health effects and/or the benefits of a healthy environment. The Council on Environmental Quality (CEQ) has interpreted health effects with a broad definition: “Such effects may include ecological, cultural, human health, economic or social impacts on minority communities, low income communities or Indian Tribes...when those impacts are interrelated to impacts on the natural or physical environment” (Council on Environmental Quality 1997).

The Puerco Landscape Restoration Project lies within McKinley County with the southeastern portion located in Cibola County, New Mexico. McKinley and Cibola Counties have a higher proportion of Hispanic and American Indian residents than the United States. Due to the high proportion of Hispanic and American Indian residents in the study area, it has been determined that these ethnic groups meet the Environmental Justice requirements of a minority population meaningfully greater than the population of the nation. Therefore, decision makers should pay careful attention to the potential impacts of management actions on those ethnic groups.

In the U.S., the poverty rate in 2016 (12.7 percent) was not significantly higher than the poverty rate in 2007 (12.5 percent), the year before the most recent recession. McKinley and Cibola Counties are two of the poorest counties in New Mexico. In 2016, the McKinley County poverty

rate was 34.4 percent and the rate for Cibola County was 26.9%. Both of these counties and New Mexico had poverty rates higher than the national average. Such rates suggest that a substantial proportion of the existing population should be considered as a low-income group. Therefore, decisions regarding future management actions on the Mt Taylor Ranger District should carefully assess the effects on low-income populations.

Economic Conditions and Trends:

Employment and income statistics are important indicators of economic health. The most common industries in 2016 for McKinley County were Health Care/Social Assistance (29%), Educational Services (21%), and Accommodation and Food Services (11%). In Cibola County the most common industries are similar with Health Care/Social Assistance (23%), Educational Services (13%), and Retail Trade 12%). In the city of Grants, the most common industries are Public Administration (16%), Mining, quarrying, and oil and gas extraction (13%), and Manufacturing (9%). Forestry, fishing & related activities are a non-service related industry with relatively low total employment, however the manufacturing sector in Grants includes a wood processing plant that is dependent on timber being removed from the Cibola National Forest.

Environmental Consequences

Alternative A – No Action

Socioeconomic conditions of the local communities would not change under this alternative. Residents would not have access to temporary seasonal jobs associated with the forestry.

Alternative B

Implementation of the forest landscape treatments would contribute to the surrounding communities, the Pueblos of Zuni, Laguna, Acoma, and the Navajo Nation by creating jobs and meeting tribal member demand for forest products such as firewood. Employment for Pueblo Natural Resources/fire/fuels crews are anticipated in support of implementing landscape restoration treatments by contracting these crew resources to complete treatments in the Puerco Project on the Cibola National Forest. These crews are trained to work in a broad range of forest management activities, including timber falling, wildfire suppression, pile burning, lopping and scattering, forest stand exams, and forest equipment operation.

Environmental Justice

In cases where the management decisions are expected to create jobs and income in the local economy, it is unlikely that there would be a disproportionate adverse effect on minority and low income populations. Individuals in those populations may benefit from any increase in jobs and income in the area.

Economic Impacts

In addition to hiring more labor, industries must meet technical requirements by purchasing more equipment, supplies, and other inputs to production. Some of these purchases will be made from other local industries; for example, additional fuel purchased by the logging companies at local gas stations increases the output in the oil and gas industry.

4 Consultation and Coordination

Interdisciplinary Team Members

Alvin Whitehair – District Ranger
Shawn Martin – Forest Silviculturist
Ian Fox – Natural Resource Staff/Timber Management Officer
Anthony Pacheco - Fire and Fuels Management
Virginia Ashley-Yazzie – Range Management
Consuelo Lemaire – Wildlife Biologist
Cynthia Benedict - Tribal Consultation and Cultural Resources
Doug Kosik - Heritage Resources
Livia Crowley - Soil and Water Resources
Jessica Dunn - Scenic Resources
Richard Graves – Transportation Engineer
Arnold Wilson - Recreation and Trails
Rob Arlowe – Geographic Information Systems
Daniel LeVrier – Geographic Information Systems

Federal, State, and Local Agencies

Bureau of Indian Affairs – Navajo Region
Bureau of Land Management
U.S. Fish and Wildlife Service
Natural Resource Conservation Service
El Malpais National Monument
White Sands Missile Range
New Mexico State Forestry Division
New Mexico State Land Office
New Mexico Department of Fish and Wildlife
McKinley County Board of Commissioners
Cibola County Commissioners
McKinley Soil and Water Conservation District
Lava Soil and Water Conservation District
City of Grants
Village of Milan

Tribes

The following Tribes and Pueblos were consulted during the development of this EA.

The Pueblos of Acoma, Zuni, Santa Ana, and Jemez

Hopi Tribe
Navajo Nation
Baca/Prewitt Navajo Chapter
Casamero Lake Navajo Chapter
Crownpoint Navajo Chapter
Mariano Lake Navajo Chapter
Ramah Navajo Chapter
Smith Lake Navajo Chapter
Thoreau Navajo Chapter
To'hajiilee Navajo Chapter
Torreon Navajo Chapter
Ojo Encino Navajo Chapter
Whitehorse Lake Navajo Chapter
Baahaali Navajo Chapter
Churchrock Navajo Chapter

Congressional/Others

Senator Tom Udall
Senator Martin Heinrich
Congressman Steve Pearce
Congressman Ben Ray Lujan
Center of Biological Diversity
Wild Earth Guardians
Forest Stewards Guild
Great Old Broads for Wilderness
The Nature Conservancy
National Wild Turkey Federation
Cibola Outdoorsmen
San Mateo Grazing Association
Jeeps West
Lobo Canyon Outfitters

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Appendix A: Forest Plan Amendments

The following Project Specific Forest Plan amendments are being proposed for the Puerco Collaborative Landscape Restoration Project to facilitate restoration of highly departed forest types, wildlife habitat and increase resiliency.

The purpose of Amendment 1 is to bring the Proposed Action Alternative in alignment with the revised Mexican Spotted Owl Recovery Plan (USDI FWS 2012). Amendment 2 clarifies existing direction related to managing canopy cover and interspace in the forest plan. The purpose of Amendment 2 is to bring the project into alignment with the best available science (Reynolds et al. 2013) that provides desired conditions for restoring fire-adapted ponderosa pine in the Southwest.

Amendments 1 and 2 were evaluated in accordance with the significance amendment criteria in FSM 1926.51 and FSM 1926.52. The significance analysis for each amendment included in the Proposed Action Alternative is displayed in this appendix. No amendment alters multiple use forest plan goals and objectives, adjusts management area boundaries or management prescriptions. The changes in standards and guidelines are considered to be minor because they reflect the latest, best available science (Reynolds et al. 2013). The amendments bring the alternatives into alignment with the revised Mexican spotted owl Recovery Plan. No amendment will alter the long-term relationship between levels of multiple-use goods and services originally projected for the Cibola NF. These outputs were specific to a planning period ranging from 10 to 15 years (as identified in 1985). In the selected alternative:

- Amendment 1: The amendment would affect about 3,694 acres or 9 percent of the 41,507 acres of Mexican spotted owl protected activity center (PAC) habitat on the Cibola NF. Potentially affected PACs include:
 - ♦ 6-Mile
 - ♦ Foster
 - ♦ Milk Ranch
 - ♦ Proposed Agua Remora
 - ♦ Proposed Hogback
 - ♦ Proposed Brennan Spring
 - ♦ Proposed Smith Canyon
- Amendment 2 is a clarification amendment. The amendment will affect about 23,484 acres of goshawk habitat, approximately (6 percent) of all goshawk habitat on the Cibola NF. Managing 23,484 acres of ponderosa pine for an open reference condition will affect less than 5 percent of all suitable goshawk habitats on the Cibola NF.

For these reasons, the amendments will not result in an important effect to the entire land management planning area. Each amendment is a specific, one-time variance for this restoration project. The best available science for management in Southwestern forests Reynolds et al. 2013), the (Cibola NF) forest plan revision process, is affecting ongoing and future analyses. The plan amendments that are specific to this project do not impose direction on ongoing or future analyses.

Alternative 2 (Proposed Action) – Cibola National Forest Site-Specific Nonsignificant Forest Plan Amendments

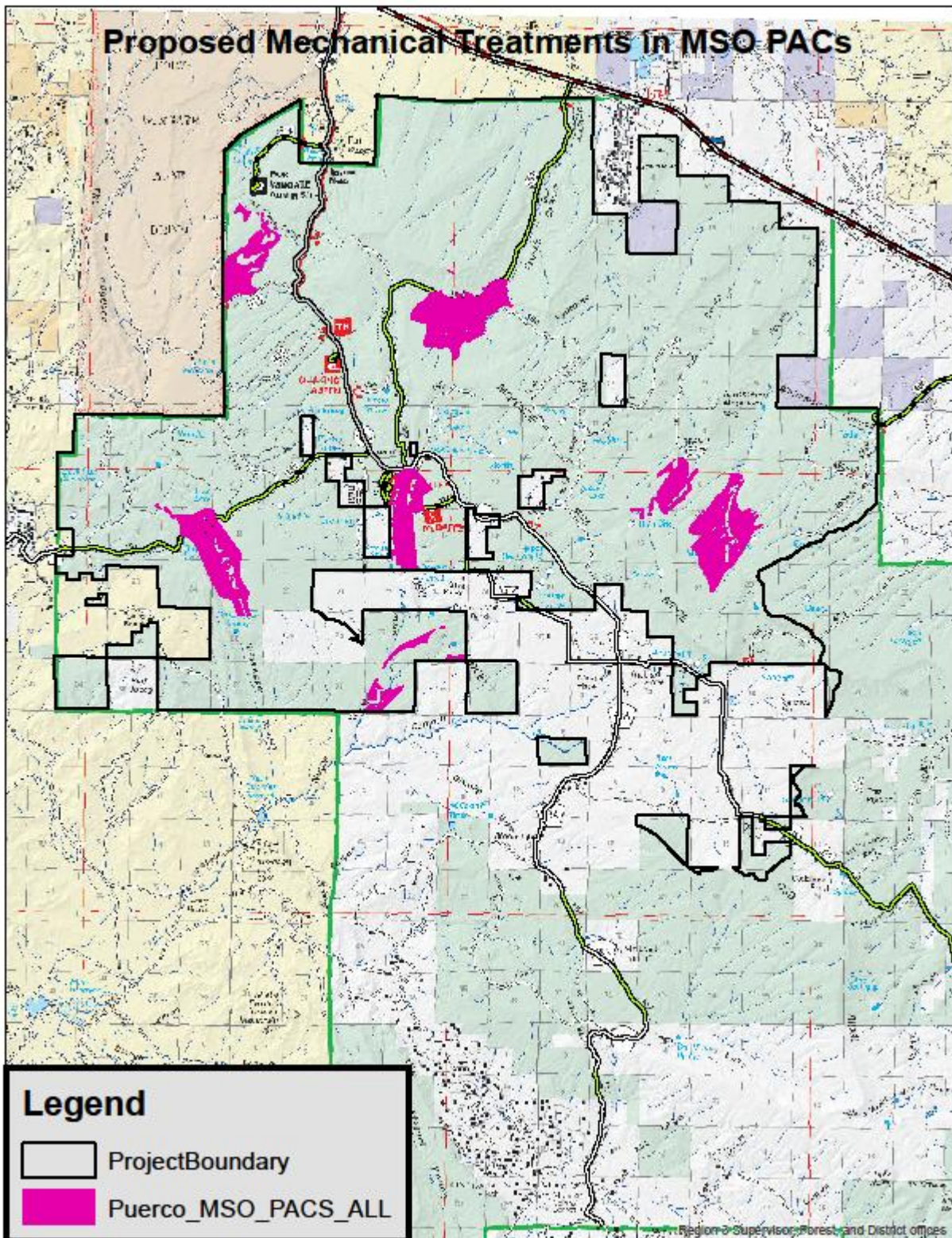
Amendment 1. Mexican Spotted Owl Habitat Management

Mechanical Treatment Up to 17.9 inches d.b.h. in Select PACs (3,694 acres)

Data evaluation has indicated that all 7 Mexican spotted owl PACs (approximately 6,416 acres) would have nesting and roosting habitat benefits, fire risk reduction, and move toward recovery plan desired conditions from mechanically cutting selected trees up to 17.9 inches d.b.h.

Increasing the range of the mechanical treatment thresholds up to 17.9 inches within 7 Mexican spotted owl PACs will provide for a higher degree of stand structure improvements to nesting and roosting habitat. The proposal is in alignment with the revised Mexican spotted owl recovery plan (USDI FWS 2012). Figure A-1 displays the general location of mechanical treatment up to 17.9- inch d.b.h., and prescribed fire. In addition, the removal of ladder and canopy fuels would reduce the crown fire risk in the 7 PACs (to the extent possible).

Figure A-1: Amendment 1: General location of mechanical treatment up to 17.9- inch d.b.h.



Puerco Collaborative Forest Landscape Restoration Project
Appendix A – Project Specific Plan Amendments

Table A-1: Amendment 1: Current and Proposed MSO Forest Plan Language

Current Forest Plan Direction	Proposed New Standard or Guideline Language for Puerco Collaborative Landscape Restoration Project
<i>MSO Standards</i>	
No corresponding direction currently exists.	The Puerco Collaborative Landscape Restoration Project will comply with the biological opinion and monitoring protocol developed in consultation with the USFWS.
Provide three levels of habitat management – protected, restricted, and other forest and woodland types to achieve a diversity of habitat conditions across the landscape (Cibola NF Forest Plan, p. 71).	Provide three levels of habitat management – protected, recovery , and other forest and woodland types to achieve a diversity of habitat conditions across the landscape (p. 65).
Protected areas include delineated protected activity centers; mixed conifer and pine-oak forests with slopes greater than 40% where timber harvest has not occurred in the last 20 years; and reserved lands which include wilderness, research natural areas, wild and scenic rivers, and congressionally recognized wilderness study areas (Cibola NF Forest Plan, p. 71).	Within the Puerco Collaborative Landscape Restoration Project boundary, protected areas include delineated protected activity centers; and reserved lands which include wilderness, research natural areas, wild and scenic rivers, and congressionally recognized wilderness study areas. Recovery habitat includes pine-oak and mixed conifer forests on all slopes (Cibola NF Forest Plan, p. 71).
Allow no timber harvest except for firewood and fire risk abatement in established protected activity centers. For protected activity centers destroyed by fire, windstorm, or other natural disaster, salvage timber harvest or declassification may be allowed after evaluation on a case-by-case basis in consultation with US Fish and Wildlife Service (Cibola NF forest plan, page 71).	Allow no timber harvest except for firewood and fire risk abatement in established protected activity centers except as follows: Allow firewood, fire risk abatement, and habitat structure improvement in the following established protected activity centers: Foster, Milk Ranch, 6-Mile, and proposed Agua Remora, Hogback, Smith Canyon and Brennan Spring PACs For protected activity centers destroyed by fire, windstorm, or other natural disaster, salvage timber harvest or declassification may be allowed after evaluation on a case-by-case basis in consultation with the U.S. Fish and Wildlife Service.
<i>MSO Guidelines – General</i>	<i>No Change</i>
<i>MSO Guidelines – Protected Areas, Protected Activity Centers</i>	
Harvest fuelwood when it can be done in such a way that effects on the owl are minimized. Manage within the following limitations to minimize effects on the owl (Cibola NF Forest Plan, p. 71-1). Retain key forest species such as oak. Retain key habitat components such as snags and large downed logs. Harvest conifers less than 9 inches in diameter only within those protected activity centers treated to abate fire risk as described below.	Harvest fuelwood when it can be done in such a way that effects on the owl are minimized. Manage within the following limitations to minimize effects on the owl (Cibola NF Forest Plan, p. 71-1). Retain key forest species such as oak. Retain key habitat components such as snags and large downed logs. Harvest conifers less than 9 inches in diameter only within those protected activity centers treated to abate fire risk as described below, Harvest conifers up to 17.9 inches diameter within Foster, Milk Ranch, 6-Mile, and proposed Agua Remora, Hogback, Smith Canyon and Brennan Spring PACs to abate fire risk and improve habitat structure.

Puerco Collaborative Forest Landscape Restoration Project
Appendix A – Project Specific Plan Amendments

<p>Treat fuel accumulations to abate fire risk.</p> <p>–Select for treatment 10% of the protected activity centers where nest sites are known in each recovery unit having high fire risk conditions. Also select another 10% of the protected activity centers where nest sites are known as a paired sample to serve as control areas (Cibola National Forest Plan, page 71-1).</p> <p>–Designate a 100 acre "no treatment" area around the known nest site of each selected protected activity center. Habitat in the no treatment area should be as similar as possible in structure and composition as that found in the activity center.</p> <p>–Use combinations of thinning trees less than 9 inches in diameter, mechanical fuel treatment and prescribed fire to abate fire risk in the remainder of the selected protected activity center outside the 100 acre "no treatment" area.</p>	<p>Treat fuel accumulations to abate fire risk.</p> <p>–Select for treatment 10% of the protected activity centers where nest sites are known in each recovery unit having high fire risk conditions. Also select another 10% of the protected activity centers where nest sites are known as a paired sample to serve as control areas (Cibola National Forest Plan, page 71-1).</p> <p>–Designate a 100 acre "no treatment" area around the known nest site of each selected protected activity center. Habitat in the no treatment area should be as similar as possible in structure and composition as that found in the activity center.</p> <p>–Use combinations of thinning trees less than 9 inches in diameter, mechanical fuel treatment and prescribed fire to abate fire risk in the remainder of the selected protected activity center outside the 100 acre "no treatment" area except as follows:</p> <p>Use combinations of thinning trees up to 17.9 inches DBH within: Foster, Milk Ranch, 6-Mile, and proposed Agua Remora, Hogback, Smith Canyon and Brennan Spring PACs, mechanical fuel treatment and prescribed fire to abate fire risk and improve habitat structure in the remainder of the selected protected activity center outside the 100-acre "no treatment" area.</p>
<p>Treat fuel accumulations to abate fire risk. Pre and post treatment monitoring should be conducted in all protected activity centers treated for fire risk abatement. (See monitoring guidelines) (Cibola National Forest Plan, page 71-2).</p>	<p>Treat fuel accumulations to abate fire risk. Pre and post treatment monitoring should be conducted in all protected activity centers treated for fire risk abatement. Monitoring guidelines:</p> <p>Monitoring of owl populations and habitat within the Puerco Collaborative Landscape Restoration Project boundary will follow the monitoring protocol developed and finalized through that project's consultation with the US Fish and Wildlife Service.</p>

Puerco Collaborative Forest Landscape Restoration Project
Appendix A – Project Specific Plan Amendments

Mixed Conifer and Pine-oak Forests (See glossary definition): Manage to ensure a sustained level of owl nest/roost habitat well distributed across the landscape. Create replacement owl nest/roost habitat where appropriate while providing a diversity of stand conditions across the landscape to ensure habitat for a diversity of prey species. The following table displays the minimum percentage of restricted area which should be managed to have nest/roost characteristics. The minimum mixed conifer restricted area includes 10% at 170 basal area and an additional amount of area at 150 basal area. The additional area of 150 basal area is +10% in BR-E and +15% in all other recovery units. The variables are for stand averages and are minimum threshold values and must be met simultaneously. In project design, no stands simultaneously meeting or exceeding the minimum threshold values should be reduced below the threshold values unless a district-wide or larger landscape analysis of restricted areas shows that there is a surplus of restricted area acres simultaneously meeting the threshold values. Management should be designed to create minimum threshold conditions on project areas where there is a deficit of stands simultaneously meeting minimum threshold conditions unless the district-wide or larger landscape analysis shows there is a surplus. (Cibola NF Forest Plan, pp.71-2).

Mixed Conifer and Pine-oak Forests (See glossary definition): Manage to ensure a sustained level of owl nesting and roosting habitat well distributed across the landscape. Create replacement owl nesting and roosting habitat where appropriate while providing a diversity of stand conditions across the landscape to ensure habitat for a diversity of prey species. The following table displays the minimum percentage of restricted area which should be managed to have nesting and roosting characteristics. The minimum mixed conifer restricted area includes up to 10 percent at 170 square feet basal area and an additional amount of area at 150 square feet basal area. The additional area of 150 square feet basal area is +10 percent in BR-E and +15 percent in all other recovery units. **In pine-oak, the minimum restricted area includes up to 10 percent at 110 to 150 square feet basal area.** The variables are for stand averages and are minimum **target and** threshold **habitat** values and must be met simultaneously. In project design, no stands simultaneously meeting or exceeding the minimum **target and** threshold **habitat** values should be reduced below **target and** threshold values unless a districtwide or larger landscape analysis of restricted areas shows that there is a surplus of restricted area acres simultaneously meeting target and threshold values. Management should be designed to create minimum **target and** threshold **habitat** conditions on project areas where there is a deficit of stands simultaneously meeting minimum target and threshold habitat conditions unless the districtwide or larger landscape analysis shows there is a surplus.

Puerco Collaborative Forest Landscape Restoration Project
Appendix A – Project Specific Plan Amendments

<i>Restricted Areas (Mixed conifer, pine-oak, and riparian forests)</i>	
No corresponding direction	Target habitat is a category of restricted habitat intended to provide future nesting and roosting habitat (see glossary definition for restricted habitat). The minimum values identified for the forest attributes represent the threshold for meeting nesting and roosting conditions (see the definition for threshold habitat). They can also be targets to be achieved with time and management. If less than 10 percent of the restricted habitat in ponderosa pine-Gambel oak qualifies as threshold habitat, the areas that can eventually achieve all threshold conditions simultaneously should be identified as target habitat and managed to achieve threshold conditions as rapidly as possible. Because no known nests or roosts occur in restricted habitat, target habitat is considered future nesting and roosting habitat.
No corresponding direction	Threshold habitat is a category of restricted habitat intended to provide for future nesting and roosting habitat (see definition for restricted habitat). A variety of forest structural attributes are used to define when nesting and roosting habitat is achieved (summarized in table III.B.1 of the 1995 recovery plan and table C-2 of the 2012 recovery plan). Threshold habitat meets or exceeds these values. When the minimum values identified for the forest attributes are met simultaneously, they represent the threshold of nesting and roosting conditions. Up to 10 percent of restricted habitat in ponderosa pine-Gambel oak should be designated as threshold habitat. Management in threshold habitat cannot lower any of the forest attribute values below the nesting and roosting threshold unless a landscape analysis demonstrates an abundance of this habitat. Because no known nests or roosts occur in restricted habitat, target habitat is managed as future nesting and roosting habitat.

Table A-2. Minimum Percentage of Restricted Area which should be managed to have Nest/Roost Characteristics (USDI 2012)

Variable	MC All RU	MC BR-E RU	MC Other RU	Pine Oak
Restricted Area %	10%	+10%	+15%	10%
Stand Average for: Basal Area	170	150	150	110-150
18 inch + trees/ac	20	20	20	20
Oak basal area	NA	NA	NA	20
Percent total existing stand density index by size class:				
12-18"	10	10	10	15
18-24"	10	10	10	15
24+"	10	10	10	15
MC = Mixed Conifer, RU = Recovery Unit(s), BR-E = Basin and Range – East Recovery Unit				

Consistency with the Revised Mexican spotted owl Recovery Plan

The need to evolve from managing solely for firewood collection and fire risk abatement is reflected in the revised 2012 recovery plan. In the revised plan, the U.S. Fish and Wildlife Service states, “Management recommendations are most conservative within PACs, but by no means advocate a “hands-off” approach. The recovery team recognizes situations exist where management is needed to sustain or enhance desired conditions for the owl, including fire-risk reduction, as well as monitoring owl response. Mechanical treatments in some PACs may be needed to achieve these objectives; determining which PACs may benefit from mechanical treatments requires a landscape analysis to determine where the needs of fire risk reduction and habitat enhancement are greatest. PACs are the only form of protected habitat included in this revised Plan” (USDI 2012, page VIII). Treatments that would improve habitat by treating up to 17.9 inches d.b.h. is consistent with direction for retaining large trees in the revised Mexican spotted owl recovery plan (page 268 and table C.1-C.3 on pages 274 to 278).

By definition, PAC habitat and especially core areas have high fuel loading and the uncharacteristic accumulation of ground fuels puts them at further risk. Reducing fuels to reduce the risk of high-severity fire in these important habitats would contribute toward conservation of this threatened species. The amendment (allowing low intensity prescribed burning within the 100-acre core area) would eliminate the need for hand line and/or dozer line construction, allow for the maximum number of surrounding PAC acres to be treated with prescribed fire, and would potentially minimize up to 700 acres of ground disturbance to PAC habitat. Reducing fire risk in core areas is consistent with the direction in the Mexican spotted owl recovery plan, “Planned ignitions (prescribed fire) and unplanned ignitions (wildland fire) should be allowed to enter cores only if they are expected to burn with low fire severity and intensity. Fire lines, check-

lines, backfiring, and similar fire management tactics can be used to reduce fire effects and to maintain key habitat elements (e.g., hardwoods, large downed logs, snags, and large trees)” (Revised Mexican spotted owl Recovery Plan, page 263).

Managing for 110 to 150 square feet basal area is consistent with the minimum desired conditions for pine-oak forests managed for Recovery nesting/roosting habitat (page 278, table C.3). The continued use of the terms (and definitions) of target and threshold habitat (considered future nesting and roosting habitat as part of restricted habitat is consistent with Revised Mexican spotted owl Recovery Plan’s direction for nesting and roosting in recovery habitat (see page 274, table C.1).

The plan amendment defers monitoring to the project’s biological opinion from the U.S. Fish and Wildlife Service. Following the current forest plan direction would have resulted in few PACs being treated during the life of the project. Current plan direction suspends treatments until monitoring of the initial sample shows there are no negative impacts, or negative impacts are mitigated by modifying treatments. Following this direction could delay implementation for years, potentially decades’ if changes in populations had to be documented before additional treatments were implemented. Following the current forest plan direction would have resulted in few PACs being treated with the objective of fire-risk reduction or improving condition for the owl during the life of the project.

The deviation from selecting PACs and monitoring in 10 percent increments is consistent with the revised 2012 Mexican spotted owl recovery plan which states mechanical treatments can be conducted in up to 20 percent of the total non-core PAC area within each ecosystem management unit (treatments can exceed 20 percent of the non-core acreage a single PAC (page 274, table C.1). As noted above, the plan amendment defers monitoring to the project’s biological opinion from the U.S. Fish and Wildlife Service. This amendment meets the intent of the revised (2012) recovery plan by reducing the potential for creating excessively fragmented habitat and managing stands based on their capability to attain desired stand conditions. This amendment does not affect habitat designated in previous projects or in mixed-conifer habitat.

Significance Evaluation

Per 36 CFR 219:

219.8 Amendment:

(a) *Amending plans.* A plan amendment may add, modify, or rescind one or more of the decisions of a plan (§ 219.7). An amendment decision must be based on the identification and consideration of issues (§ 219.4), applicable information (§ 219.5), and an analysis of the effects of the proposed amendment (§ 219.6). In developing an amendment, the responsible official must provide opportunities for collaboration consistent with § 219.12 through § 219.18.

(b) *Environmental review of a proposed plan amendment.* For each proposal for a plan amendment, the responsible official must complete appropriate environmental analyses and

public involvement in accordance with Forest Service NEPA procedures. A proposed amendment that may create a significant environmental effect and thus require preparation of an environmental impact statement is considered to be a significant change in the plan. If a proposal for amendment requires the preparation of an environmental impact statement, the responsible official must give public notice and an opportunity to comment on the draft environmental impact statement for at least 90 calendar days.

Two project specific Forest Plan amendments are required under the current Forest Plan if this decision is signed prior to implementation of the revised Forest Plan. These project-specific amendments would be one-time adjustments to the current forest plan made according to the 2012 Planning Rule (36 CFR 219.13). Based on the regulations at 36 CFR 219.13 (b)(2) opportunities for public participation and notification on the plan amendments is combined with the public participation and notification processes used for project planning at 36 CFR 218.

The Forest Service has enacted new regulations in 2012 to guide changes to forest plans, including amendments. Although the Cibola National Forest is currently revising its forest plan using a prior planning rule enacted in 1982, the 2012 planning rule (36 CFR 219) requires the Forest Service to use the new planning rule for amendments of plans created under a prior rule.¹⁵ Per 36 CFR 219.17(b) (2) for all projects initiated after May 9, 2015 “all plan amendments must be initiated, completed and approved under the requirements of this part.” The regulations at 36 CFR 219 are very different than the regulations under which the 1985 Cibola Forest Plan was developed, and reflects the complex nature of modern forest planning and management.

The project-specific amendments included in this project may affect substantive requirements of the 2012 planning rule at 36 CFR 219.9; which requires Forest Plans to provide for maintaining the diversity of plant and animal communities and the persistence of native species in the plan are. Since this project includes two project-specific amendments to modify current Forest Plan direction related to the management of Northern goshawk and Mexican spotted owl habitats, it is possible that the plan’s inherent capability to meet these attributes would be affected. We would like to hear your comments on the project, including the potential effects of the project-specific amendments on the Diversity of plant and animal communities identified at 36 CFR 219.9.

One or both project-specific amendments may not be necessary under the new Forest Plan, depending on the content of the approved final Forest Plan. Amendment 1 to the current Forest Plan relates to allowing management actions to more closely follow guidelines in the revised Mexican Spotted Owl Recovery Plan (USDI Fish and Wildlife Service, 2012) versus Forest Plan language based on the 1995 Recovery Plan; and Amendment 2 relates to the management of canopy cover and interspaces in forested stands.

¹⁵ 3 C.F.R. § 219.17 (2012).

Best Available Scientific Information (BASI): Per FSH 1909.12, Zero Code, the responsible official shall document how the best available scientific information was used to inform the assessment. The Puerco Collaborative Forest Landscape Restoration Project utilized Peer reviewed articles, scientific assessments, data prepared and managed by the Forest Service or other Federal agencies, including monitoring results, information in spatially referenced databases, data about the lands and resources of the planning unit, and various types of statistical or observational data, as well as information from public and governmental participation. Sources may be found in the Literature Cited section of this document.

Public Participation: Per FSH 1909.12, Chapter 40, during the land management planning public participation is required. Building on the experience of implementing the Bluewater CFLRP, the Puerco Collaborative Forest Landscape Restoration Project continued to:

- Directly engaged the public to exchange information with each other and work together on one or more issues during the planning process, and identified where there was agreement and disagreement.
- Worked closely with interested members of the public to clarify concerns and seek feedback on how to meet challenges presented by the planning process.
- Provided information to the public and seek suggestions as well as feedback on potential issues and concerns.
- Provided sufficient objective information to the public to convey an understanding of intended actions, processes, and preliminary issues.

Public Participation and collaboration is documented in the Public Involvement Section of Chapter One.

Timing: In terms of timing, the forest plan has been in place and amended several times since 1985, and revision efforts are underway. The forest plan incorporated direction (via an amendment) from the Forest Service Southwestern Region’s 1996 “Amendment of Forest Plans Record of Decision” (USDA FS 1996).). The actions allowed via the amendment are consistent with existing forest plan direction in that it improves nesting and rooting habitat, reduces the risk of loss from fire, and will comply with the site-specific treatment and monitoring requirements in the U.S. Fish and Wildlife Service biological opinion. Forest plan direction may be amended to incorporate the revised Mexican spotted owl recovery plan (USDI FWS 2012) which recognizes that habitat restoration, in addition to the reduction of fire risk, is key to improving habitat quality.

Location and Size: The treatment area contains about 6,416 total acres of Mexican spotted owl protected habitat. There are 7 PACs (about 6,416 acres) in the Puerco treatment area. The remaining protected habitat (411 acres of mixed conifer and pine-oak) occurs on steep slopes where timber harvest has not occurred in the previous 20 years and is not planned for mechanical treatment. Treatments for steep-slope protected habitat consist of prescribed fire only – no mechanical treatments are planned for this category of habitat. There are 56 established PACs entirely on or overlapping Cibola National Forest lands.

Mechanical treatment would affect 7 (12 percent) of the 60 (includes 4 new proposed PACs in the Puerco Project) Cibola NF PACs and 3,694 acres (58 percent) of PAC habitat in the entire treatment area. Outside of PACs, there are 14,110 acres of mixed conifer and pine-oak forest type in the Puerco Project.

Changing the minimum basal area value in restricted habitat would only apply to target and threshold acres (those restricted acres being managed for nesting/roosting habitat as defined in the forest plan). About 1,346 acres (10 percent) of restricted target or threshold habitat could be affected by using a basal area range of 110 to 150 within the treatment area. This equates to affecting about 10 percent of the total estimated (13,700 acres) Mexican spotted owl restricted habitat on the Cibola NF's portion of the project area. Work will be accomplished incrementally over a 10-15 year period. On average, less than 250 acres of PAC habitat would be treated per year. This is expected to balance the need to reduce the risk of crown fire while allowing for monitoring and feedback loops that will allow management to be adaptive.

Relationship to Forest Goals and Objectives: The amendment is consistent with forest plan goals for wildlife and fish of managing for a diverse, well-distributed pattern of habitats for viable populations

Habitat of wildlife and fish species in cooperation with states and other agencies (Cibola National Forest plan, page 33). It is consistent with the goal to manage habitat to help recover threatened and endangered species (Cibola National Forest plan, page 33). The amendment is consistent with goals and objectives by protecting conditions and structures used by Mexican spotted owls where they exist and to set other stands on a trajectory to grow into replacement nest habitat or to provide conditions for foraging and dispersal (USDI FWS 1995, 2012).

Relationship to Management Prescriptions: Mechanical thinning up to 17.9 inches d.b.h. in 7 Mexican spotted owl PACs would affect 1 percent or less of the forestwide management area acres (Table A-2). Managing about 1,346 acres of restricted habitat to a range of 110 to 150 square feet basal area will affect 1 percent or less of the forestwide management areas. The amendment intent is consistent with the management emphasis of providing for multiple uses that includes wildlife habitat and meeting Mexican spotted owl standards and guidelines which emphasize improving and maintaining the quality of the habitat (MA 8 and MA 10) and moving ponderosa pine toward desired forest structure, including northern goshawk and Mexican spotted owl habitats.

Relationship to Outputs: Outputs identified in the forest plan are associated with MMBF of sawtimber sales and products (meet demand for timber while reducing conflict with other resources), MMBF of firewood sold and free use (provide access to firewood), grazing capacity, and permitted livestock use. The amendment will not affect outputs or change the long-term relationship between levels of goods (timber, firewood) and services. Due to the minimal acres

affected, the amendment will not alter outputs on a forestwide basis or change the long-term relationship between levels of goods (timber, firewood) and services.

In comparison the forest's total suitable timber lands (370,000 acres), the amendment would affect about 1 percent of those lands. For this reason, mechanical treatment within PACs and the minimal (1,346) acres treated in restricted habitat do not measurably increase or decrease timber outputs or firewood availability. There would be no measurable effect to outputs on a forestwide basis or the long-term relationship between levels of goods (timber, firewood) and services from managing restricted habitat for a basal area of 110 to 150 square feet, or deferring the final design of treatments and monitoring to the project's biological opinion. The amendment would not affect decisions that have been made through separate analyses on grazing capacity or permitted livestock use.

Table A-3. Alternative 2 Mexican spotted owl amendment 1 management area (MA) acres potentially affected by mechanical treatment up to 17.9 inches DBH

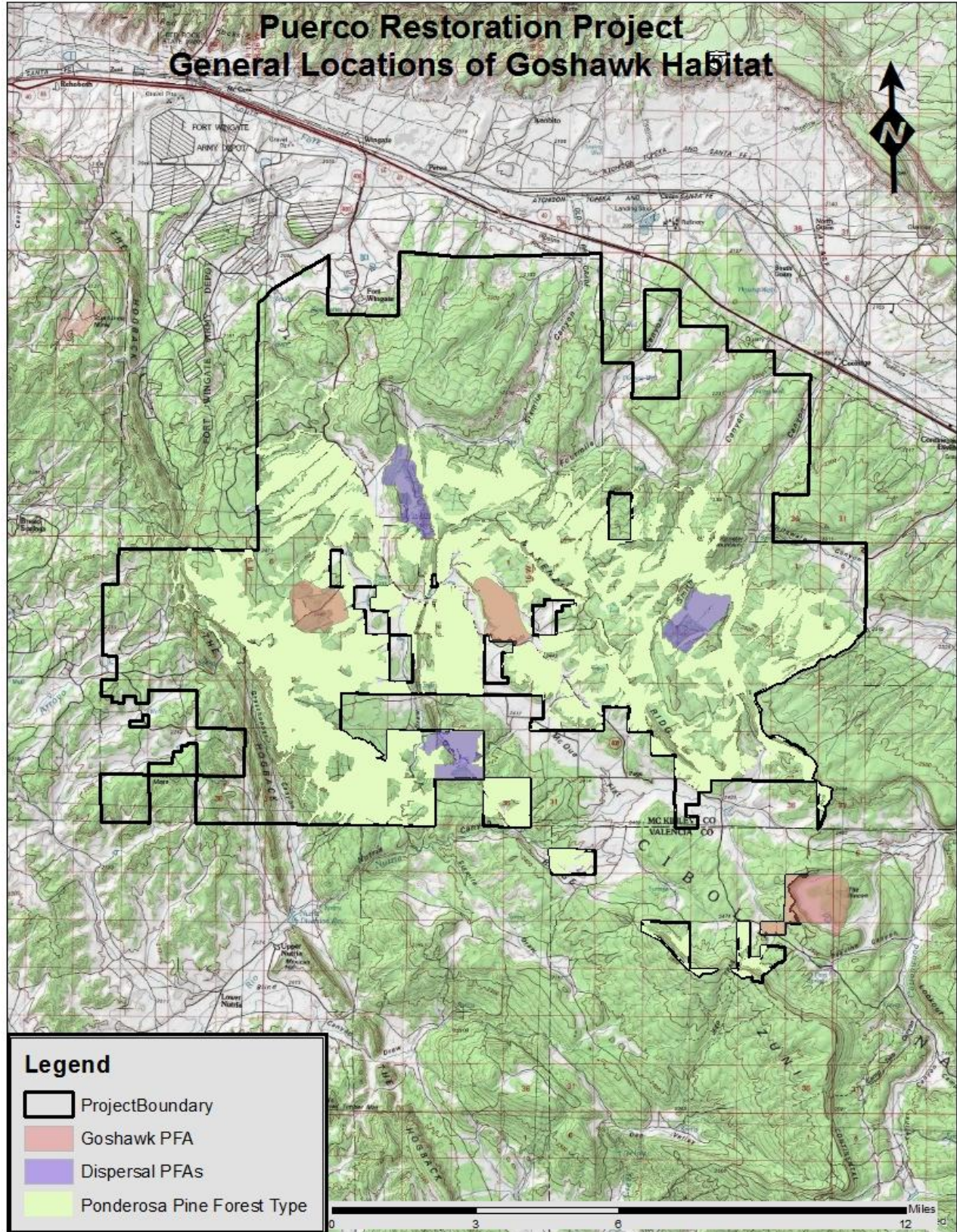
MA	MA Description	Forestwide Acres	Amendment Acres	Forestwide Acres Affected (Percent)
8	Ponderosa Pine Suitable Timberlands	292,055	2,213	<1%
10	Mixed Conifer Suitable Timberlands	49,871	0	0%
13	No Capacity Rangelands	216,993	484	<1%
14	Full Capacity Rangelands	800,767	966	<1%

Amendment 2. Management of Canopy Cover and Ponderosa Pine with an Open Reference Condition within Goshawk Habitat (Cibola NF)

Background

Canopy cover is defined as “the percentage of a fixed area covered by the crowns of plants delimited by a vertical projection of the outermost perimeter of the spread of foliage” (Reynolds et al. 1992). Obtaining consistent results has been difficult; even the definition of the term is dependent on the method of measurement. To resolve this issue, the Forest Service used the Forest Vegetation Simulation (FVS) crown width model as the basis for developing stocking densities that would achieve desired canopy cover levels. Figure A-2 displays general locations of goshawk habitat that is subject to canopy cover requirements in VSS 4 through VSS 6 on the forests.

Figure A-2: Amendment 2: General location of goshawk habitat.



Non-forested areas (interspaces) occur between individual trees, tree clumps, and tree groups. These non-forested areas (interspaces) are not equivalent to VSS 1. Whereas VSS 1 may provide openings in the short term, this structural stage is expected to regenerate tree cover in the long term. Refer to the Proposed Action in Chapter 2 which provides minimum stocking guidelines that have been developed to assure canopy cover requirements are met.

Approximately 38,373 acres (53 percent) of the forested areas (ponderosa pine and ponderosa pine – PJ mix) within the Puerco project area on the Cibola NF have an open reference condition. The desired condition is to have a portion of these acres (about 33,560 acres) managed as a relatively open forest with trees typically aggregated in small groups within a grass/forb/shrub matrix (Woolsey 1911, Cooper 1960, White 1985, Pearson 1950, Covington et al. 1997, Abella and Denton 2009).

Amendment Description

In the “Vegetation Management – Landscapes Outside Goshawk Post-fledging Family Areas” and “Vegetation Management –Within Post-fledging Family Areas” section of the forest plan, a site-specific, nonsignificant plan amendment will: (1) add the desired percentage of interspace within uneven-aged stands to facilitate restoration, (2) add the interspace distance between tree groups, (3) add language clarifying where canopy cover is and is not measured, (4) allow up to 33,560 acres to be managed for an open reference condition which affects canopy cover guidelines for VSS 4 through VSS 6 groups and reserve trees, and (5) add a definition to the forest plan glossary for the terms interspaces, open reference condition, and stands.

The forest plan directs projects to manage for uneven-aged stand conditions within goshawk habitat. Forested groups consist of an interspersed of six vegetation structural stages (VSS 1 to VSS 6). For the purposes of this amendment, the following definitions apply:

- **Stands** are defined as a contiguous area of trees sufficiently uniform in forest type, composition, structure, and age class distribution, growing on a site of sufficiently uniform conditions to be a distinguishable unit. Four classification characteristics are generally used to distinguish forest stands: biophysical site (soils, aspect, elevation, plant community association, climate, etc.), species composition, structure (density, and age (1-aged, 2-aged, uneven-aged)), and management emphasis (administrative requirements and local management emphasis that will shape structure over time). Based upon Agency guidelines, the minimum stand mapping size is 10 acres.
- **Interspaces** are defined as the open space between tree groups intended to be managed for grass/forb/shrub vegetation during the long term. Interspaces may include scattered single trees.
- **Open reference condition** is defined as forested ponderosa pine areas with mollic-integgrade soils to be managed as a relatively open forest with trees typically aggregated in small groups within a grass/forb/shrub matrix.

Edited or added verbiage is shown in **bold** in table A-4

Puerco Collaborative Forest Landscape Restoration Project
Appendix A – Project Specific Plan Amendments

Table A-4: Amendment 2: Current and Proposed Goshawk Forest Plan Language

Current Cibola NF Forest Plan Direction	New Guideline Language
<i>Landscapes Outside of Goshawk Post-fledging Areas</i>	
No similar direction in forest plan	General: Within ponderosa pine stands, manage over time for uneven-aged stand conditions composed of heterogeneous mosaics of tree groups and single trees, with interspaces between tree groups. The size of tree groups, as well as sizes and shapes of interspaces, should be variable. Over time, the spatial location of the tree groups and interspaces may shift within the uneven-aged stand.
General: The distribution of vegetation structural stages for ponderosa pine, mixed conifer and spruce-fir forests is 10 percent grass/forb/shrub (VSS 1), 10 percent seedling-sapling (VSS 2), 20 percent young forest (VSS 3), 20 percent mid-aged forest (VSS 4), 20 percent mature forest (VSS 5), 20 percent old forest (VSS 6). NOTE: The specified percentages are a guide and actual percentages are expected to vary + or – up to 3 percent (Cibola NF forest plan, page 71-7).	General: For the areas managed for tree crown development , the distribution of vegetation structural stages for ponderosa pine, mixed conifer and spruce-fir forests is 10 percent grass/forb/shrub (VSS 1), 10 percent seedling-sapling (VSS 2), 20 percent young forest (VSS 3), 20 percent mid-aged forest (VSS 4), 20 percent mature forest (VSS 5), and 20 percent old forest (VSS 6). Note: the specified percentages are a guide, and actual percentages are expected to vary plus or minus up to 3 percent.
Snags are 18" or larger d.b.h. and 30 feet or larger in height, downed logs are 12 inches in diameter and at least 8 feet long, woody debris is 3 inches or larger on the forest floor, canopy cover is measured with vertical crown projection on average across the landscape (Cibola NF forest plan, page 71-7).	Snags are 18" or larger d.b.h. and 30 feet or larger in height, downed logs are 12 inches in diameter and at least 8 feet long, woody debris is 3 inches or larger on the forest floor, canopy cover as defined by vertical crown projection is evaluated within mid-aged to old forest vegetation structural stage groups (VSS 4, 5, and 6).
No corresponding forest plan direction	Develop and maintain a highly diverse vegetation mosaic: 30 to 90 percent of the uneven-aged stand should be under ponderosa pine and deciduous tree crowns. Within areas managed for an open reference condition, 10 to 30 percent of the uneven-aged stand should be under ponderosa pine and deciduous tree crowns.
No corresponding forest plan direction	Tree group spatial distribution may be highly variable based on local site and current conditions; the interspaces between groups may range from 20 to 200 feet, but generally between 25 and 100 feet apart from drip line to adjacent drip line. This spacing of groups is not affected by single trees in the interspace.
No corresponding forest plan direction	Each tree group is generally dominated by one vegetation structure stage. The spatial arrangement of trees, high dispersion of vegetation structural stage diversity, and interspaces comprise each uneven-aged forest stand. Collectively these stands aggregate to uneven-aged forest landscapes, similar to natural conditions.
Canopy Cover: Canopy cover guidelines apply only to mid-aged to old forest structural stages (VSS 4, VSS 5, and VSS 6) and not to grass/forb/shrub to young forest structural stages (VSS 1, VSS 2, and VSS 3) (Cibola NF forest	Canopy Cover: Canopy cover guidelines apply only to mid-aged to old forest structural stage groups (VSS 4, VSS 5, and VSS 6) and not to grass/forb/shrub to young forest structural stage groups (VSS 1, VSS 2, and VSS 3) or in interspaces, natural meadows, grasslands, or other areas not managed

Puerco Collaborative Forest Landscape Restoration Project
Appendix A – Project Specific Plan Amendments

plan, page 71-7).	for forest cover.
No corresponding forest plan direction	Canopy cover is evaluated at the group level within mid-aged to old forest structural stages groups (VSS 4, VSS 5 and VSS 6) and not within grass/forb/shrub to young forest structural stage groups (VSS 1, VSS 2, and VSS 3) or in interspaces, natural meadows and grasslands, or other areas not managed for forest conditions.
Ponderosa Pine: Canopy Cover for mid-aged forest (VSS 4) should average 40+ percent, mature forest (VSS 5) should average 40+ percent, and old forest (VSS 6) should average 40+ percent. Opening size is up to 4 acres with a maximum width of up to 200 feet. One group of reserve trees, 3–5 trees per group, will be left if the opening is greater than an acre in size. Leave at least 2 snags per acre, 3 downed logs per acre, and 5–7 tons of woody debris per acre (Cibola NF forest plan, page 71-7).	Ponderosa Pine: Canopy cover for mid-aged forest (VSS 4) should average 40+ percent, mature forest (VSS 5) should average 40+ percent, and old forest (VSS 6) should average 40+ percent. Opening size is up to 4 acres with a maximum width of up to 200 feet. One group of reserve trees, three to five trees per group, will be left if the created regeneration opening is greater than an acre in size. Leave at least two snags per acre, three downed logs per acre, and 5–7 tons of woody debris per acre. In acres managed for an open reference condition, canopy cover guidelines for VSS 4 through VSS 6 groups do not apply. One group of reserve trees, with a minimum of one to two trees per group will be left if the interspace size is greater than an acre in size. Interspace size is up to 4 acres. Leave at least two snags per acre, three downed logs per acre, and 5–7 tons of woody debris per acre
<i>Vegetation Management – Within Post-fledging Family Areas</i>	
No similar direction in forest plan	Canopy cover is evaluated at the group level within mid-aged to old forest structural stages groups (VSS 4, VSS 5 and VSS 6) and not within grass/forb/shrub to young forest structural stage groups (VSS 1, VSS 2, and VSS 3) or in interspaces, natural meadows and grasslands, or other areas not managed for forest conditions.
No corresponding forest plan direction	Develop and maintain a highly diverse vegetation mosaic: 30 to 90 percent of the uneven-aged stand should be under ponderosa pine and deciduous tree crowns.
No corresponding forest plan direction	Tree group spatial distribution may be highly variable based on local site and current conditions; the interspaces between groups may range from 20 to 200 feet, but generally between 25 and 100 feet apart from drip line to adjacent drip line. This spacing of groups is not affected by single trees in the interspace.
No corresponding forest plan direction	Each tree group is generally dominated by one vegetation structure stage. The spatial arrangement of trees, high dispersion of VSS structural stage diversity, and interspaces comprise each uneven-aged forest stand. Collectively these stands aggregate to uneven-aged forest landscapes, similar to natural conditions.
<i>Glossary</i>	
No corresponding forest plan language	Interspaces: The open space between tree groups intended to be

Puerco Collaborative Forest Landscape Restoration Project
Appendix A – Project Specific Plan Amendments

	managed for grass/forb/shrub vegetation during the long term. Interspaces may include scattered single trees.
No corresponding forest plan language	Open reference condition: Forested ponderosa pine areas to be managed as a relatively open forest with trees typically aggregated in small groups within a grass/forb/shrub matrix.
No corresponding forest plan language	Stands: Contiguous area of trees sufficiently uniform in forest type, composition, structure, and age class distribution, growing on a site of sufficiently uniform conditions to be a distinguishable unit.

Significance Evaluation

Per 36 CFR 219:

219.8 Amendment:

(a) *Amending plans.* A plan amendment may add, modify, or rescind one or more of the decisions of a plan (§ 219.7). An amendment decision must be based on the identification and consideration of issues (§ 219.4), applicable information (§ 219.5), and an analysis of the effects of the proposed amendment (§ 219.6). In developing an amendment, the responsible official must provide opportunities for collaboration consistent with § 219.12 through § 219.18.

(b) *Environmental review of a proposed plan amendment.* For each proposal for a plan amendment, the responsible official must complete appropriate environmental analyses and public involvement in accordance with Forest Service NEPA procedures. A proposed amendment that may create a significant environmental effect and thus require preparation of an environmental impact statement is considered to be a significant change in the plan. If a proposal for amendment requires the preparation of an environmental impact statement, the responsible official must give public notice and an opportunity to comment on the draft environmental impact statement for at least 90 calendar days.

Two project specific Forest Plan amendments are required under the current Forest Plan if this decision is signed prior to implementation of the revised Forest Plan. These project-specific amendments would be one-time adjustments to the current forest plan made according to the 2012 Planning Rule (36 CFR 219.13). Based on the regulations at 36 CFR 219.13 (b)(2) opportunities for public participation and notification on the plan amendments is combined with the public participation and notification processes used for project planning at 36 CFR 218.

The Forest Service has enacted new regulations in 2012 to guide changes to forest plans, including amendments. Although the Cibola National Forest is currently revising its forest plan using a prior planning rule enacted in 1982, the 2012 planning rule (36 CFR 219) requires the Forest Service to use the new planning rule for amendments of plans created under a prior rule.¹⁶ Per 36 CFR 219.17(b) (2) for all projects initiated after May 9, 2015 “all plan amendments must be initiated, completed and approved under the requirements of this part.” The regulations at 36 CFR 219 are very different than the regulations under which the 1985 Cibola Forest Plan was developed, and reflects the complex nature of modern forest planning and management.

The project-specific amendments included in this project may affect substantive requirements of the 2012 planning rule at 36 CFR 219.9; which requires Forest Plans to provide for maintaining the diversity of plant and animal communities and the persistence of native species in the plan are. Since this project includes two project-specific amendments to modify current Forest Plan direction related to the management of Northern goshawk and Mexican spotted owl habitats, it is possible that the plan’s inherent capability to meet these attributes would be affected. We would

¹⁶ 3 C.F.R. § 219.17 (2012).

like to hear your comments on the project, including the potential effects of the project-specific amendments on the Diversity of plant and animal communities identified at 36 CFR 219.9.

One or both project-specific amendments may not be necessary under the new Forest Plan, depending on the content of the approved final Forest Plan. Amendment 1 to the current Forest Plan relates to allowing management actions to more closely follow guidelines in the revised Mexican Spotted Owl Recovery Plan (USDI Fish and Wildlife Service, 2012) versus Forest Plan language based on the 1995 Recovery Plan; and Amendment 2 relates to the management of canopy cover and interspaces in forested stands.

Best Available Scientific Information (BASI): Per FSH 1909.12, Zero Code, the responsible official shall document how the best available scientific information was used to inform the assessment. The Puerco Collaborative Forest Landscape Restoration Project utilized Peer reviewed articles, scientific assessments, data prepared and managed by the Forest Service or other Federal agencies, including monitoring results, information in spatially referenced databases, data about the lands and resources of the planning unit, and various types of statistical or observational data, as well as information from public and governmental participation. Sources may be found in the Literature Cited section of this document.

Public Participation: Per FSH 1909.12, Chapter 40, during the land management planning public participation is required. Building on the experience of implementing the Bluewater CFLRP, the Puerco Collaborative Forest Landscape Restoration Project continued to:

- Directly engaged the public to exchange information with each other and work together on one or more issues during the planning process, and identified where there was agreement and disagreement.
- Worked closely with interested members of the public to clarify concerns and seek feedback on how to meet challenges presented by the planning process.
- Provided information to the public and seek suggestions as well as feedback on potential issues and concerns.
- Provided sufficient objective information to the public to convey an understanding of intended actions, processes, and preliminary issues.

Public Participation and collaboration is documented in the Public Involvement Section of Chapter One.

Timing: In terms of timing, the forest plan has been in place (and amended) since 1985 and plan revision efforts are underway.

Location and Size: There is approximately 477,052 acres of goshawk habitat on the Cibola NF (Mid-scale Vegetation, Dominance Type, Cibola GIS Database).

The canopy cover portion of the amendment would generally affect 38,373 acres (8 percent) of all goshawk habitat on the Cibola NF.

- The canopy cover portion of the amendment will affect approximately 38,373 acres (8 percent) of all goshawk habitat on the Cibola NF. The canopy cover portion of the amendment clarifies measurement occurs at the group level-only.

For these reasons, location and size was determined to be nonsignificant. The amendment would facilitate moving up to 38,000 acres toward the desired forest structure (groups and clumps with herbaceous openings) that maximizes prey base species habitat and allows for the reintroduction of fire into the ecosystem, moving toward historic reference conditions.

Relationship to Forest Goals and Objectives: The selected alternative will meet goshawk forest plan canopy cover requirements in VSS 4 to 6 in all acres except about 38,373 acres managed for an open reference condition. In all acres but the open reference condition acres, actions will move toward the desired VSS size class distribution.

The amendment is consistent with forest goals for wildlife and fish of managing habitat to maintain viable populations of wildlife and fish species and improve habitat for selected species (Cibola National Forest plan, replacement page 33). It is consistent with the goal to improve habitat for listed threatened, endangered, or sensitive species of plants and animals and other species as they become threatened or endangered (Cibola National Forest plan, replacement page 33).

Relationship to Management Prescriptions: Table A-3 displays the acres associated with Cibola NF management areas (MAs).

Canopy Cover: The acres of forestwide management areas affected by the canopy cover portion of the amendment (about 38,373 acres) would range from less than 1% percent (MA 10) to 7 percent (MA 38). The amendment is specific to this project and would not impose definition and clarification requirements on the future management of canopy cover within goshawk habitat.

Open Reference Condition: The acres of forestwide management areas affected by the open reference condition portion of the amendment (about 25,841 acres total) would range from 1 percent (MA 10) to 8 percent (MA 8). The amendment is consistent with the management emphasis of providing for multiple uses that includes wildlife habitat (MA 8 and MA 10) and moving ponderosa pine toward desired forest structure, including northern goshawk habitats. The amendment is specific to this project and would not impose requirements on future management of the about 38,373 acres of goshawk non-post-fledging family areas; however, forest plan revision decisions may.

Table A-5. Preferred alternative amendment 2 management area (MA) acres potentially affected by canopy cover amendment

MA	MA Description	Forestwide Acres	Amendment Acres	Forestwide Acres Affected (Percent)
8	Ponderosa Pine Suitable Timberlands	292,055	20,353	7%
10	Mixed Conifer Suitable Timberlands	49,871	38	<1%
13	No Capacity Rangelands	216,993	2,983	1%
14	Full Capacity Rangelands	800,767	7,926	1%

Relationship to Outputs: Outputs identified in the forest plan are associated with MMBF of sawtimber sales and products (meet demand for timber while reducing conflict with other resources), MMBF of firewood sold and free use (provide access to firewood), grazing capacity, and permitted livestock use. The amendment would not affect outputs or change the long-term relationship between levels of goods (timber, firewood) and services. No portion of the amendment would affect decisions that have been made through separate analyses on grazing capacity or permitted livestock use.

The canopy cover portion of the amendment provides clarification and disclosure of methods for meeting forest plan requirements. It has no relationship to outputs or to the relationship between the level of goods (timber, firewood) and services and would not result in a change in land productivity or timber suitability classification.

Timber Suitability: The silviculture analysis evaluated the impact of treatments on timber suitability (see silviculture report). Within the analysis area approximately 214,200 acres on the Cibola NF were considered in the timber suitability class. Unsuitable lands include areas where prescription would preclude timber production such as critical wildlife habitat and developed recreation sites as well as areas where irreversible resource damage occur. Table B 6 shows total acres for the Cibola NF as reported in the forest plan and used in the timber suitability calculation.

Appendix B: Zuni Mountain CFLR Old Tree Retention Guidelines

On November 17, 2015, Cibola NF&NG Forest Supervisor made the decision that from that point forward, excluding areas that had already been cruised and included in the NWTF Stewardship Agreement, an Old Tree Retention Strategy would be implemented for all projects that occurred within the Zuni Mountain Collaborative Forest Landscape Restoration Area

Guidelines for Retention of Pre-settlement (Mature and Old) Ponderosa Pine:

Every effort should be made to conserve old trees to promote a balanced, uneven-aged forest condition that maintains, or contributes to the restoration of pre-settlement old growth conditions characteristic of the forest type. This should be achieved by retaining pre-settlement trees, often the largest and tallest trees on site. All trees greater than 24” DBH will be retained on site regardless of condition or old tree characteristics, unless deemed an imminent hazard^[1] to people or property.

In addition to trees >24” diameter, all trees with pre-settlement characteristics will be retained. For ponderosa pine, pre-settlement trees (≈1865) may be determined by the following characteristics described by Thomson (1940)^[2] as age class 3 (intermediate to mature) and age class 4 (mature to old):

- Age – approximately 150 years and older.
- Bark – ranging from reddish brown, shading to black in the top with moderately large plates between the fissures to reddish brown to yellow, with very wide, long and smooth plates occupying more than 50% of the tree bole.
- Branching – ranging from upturned in upper third of the crown, horizontal in the middle third and drooping in the lower third of the crown to mostly large, drooping, gnarled or crooked. Branch whorls range from incomplete and indistinct except at the top to completely indistinct and incomplete.

^[2] Thomson, W. G. 1940. A Growth Rate Classification of Southwestern Ponderosa Pine. Journal of Forestry. 38:547-553.

Figure B-1. Bark Characteristics between young and old ponderosa pine: far left = Young, middle left = Intermediate, right = Old.



Additional Characteristics to Consider for Wildlife Tree Retention and Safety:

- Favor ponderosa pine with: flat tops, large horizontal limbs, broken branches, spiked (dead) top, advanced signs of decay: trees with damage or decay in the form of lightning scars, visible rot, fire scars/cat faces or bark seams beginning at the base of the tree, or gray xylem (hardwood) with or without the presence of holes or vertical cracks. Freshly exposed xylem wood where the tree may have sealed the wound with sap is not considered advanced decay.
- Intermediate aged trees with larger, reddish brown, smooth platy bark and one or more of the above characteristics can also be good snag/wildlife recruitment trees.
- Poor form (Minimum diameter that applies to this description is 12 inches DBH): dominant multiple forks, crooks, and sweeps may be used as selection criteria to leave a tree if the tree exhibits none of the old-tree characteristics or advanced decay. The mere presence of these characteristics should not automatically determine the tree is to be left.
- Presence of nests in the tree canopy. Cavity holes, burls or conks on the tree bole.

- Evaluate trees for the presence of metal within the bole, such as fencing wire, stakes, spikes, or nails. If cutting a tree poses a safety hazard to the tree faller, it should be retained.
- Hazard trees should be removed regardless of age and size per agency protocols to prevent personal injury and property damage. Any leave tree may be felled for safety purposes, at the discretion of the contract/agreement administrator.

Appendix C: Transportation System Maps

Figure C-1. USFS System Roads.

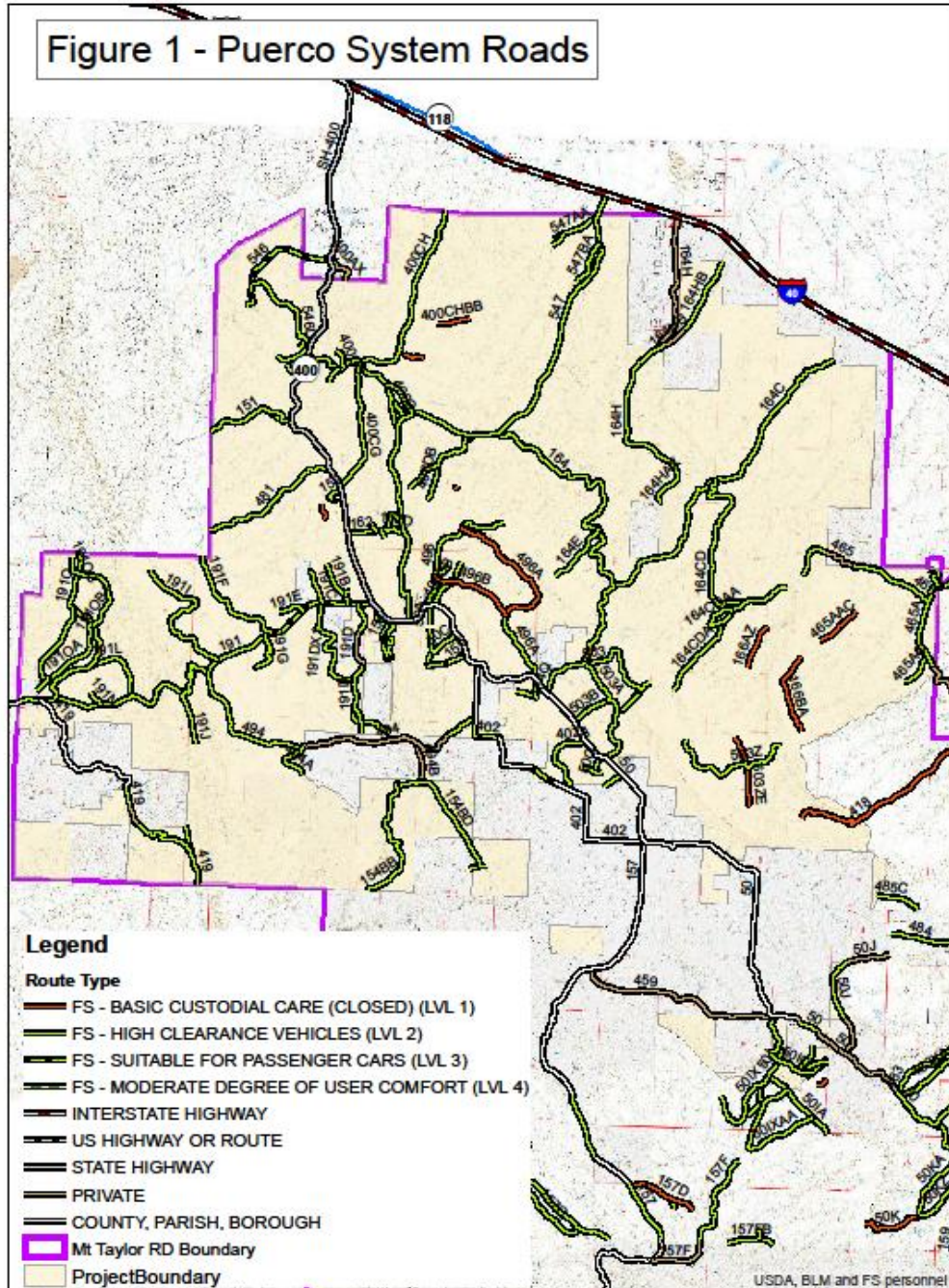


Figure C-2. Unauthorized Roads

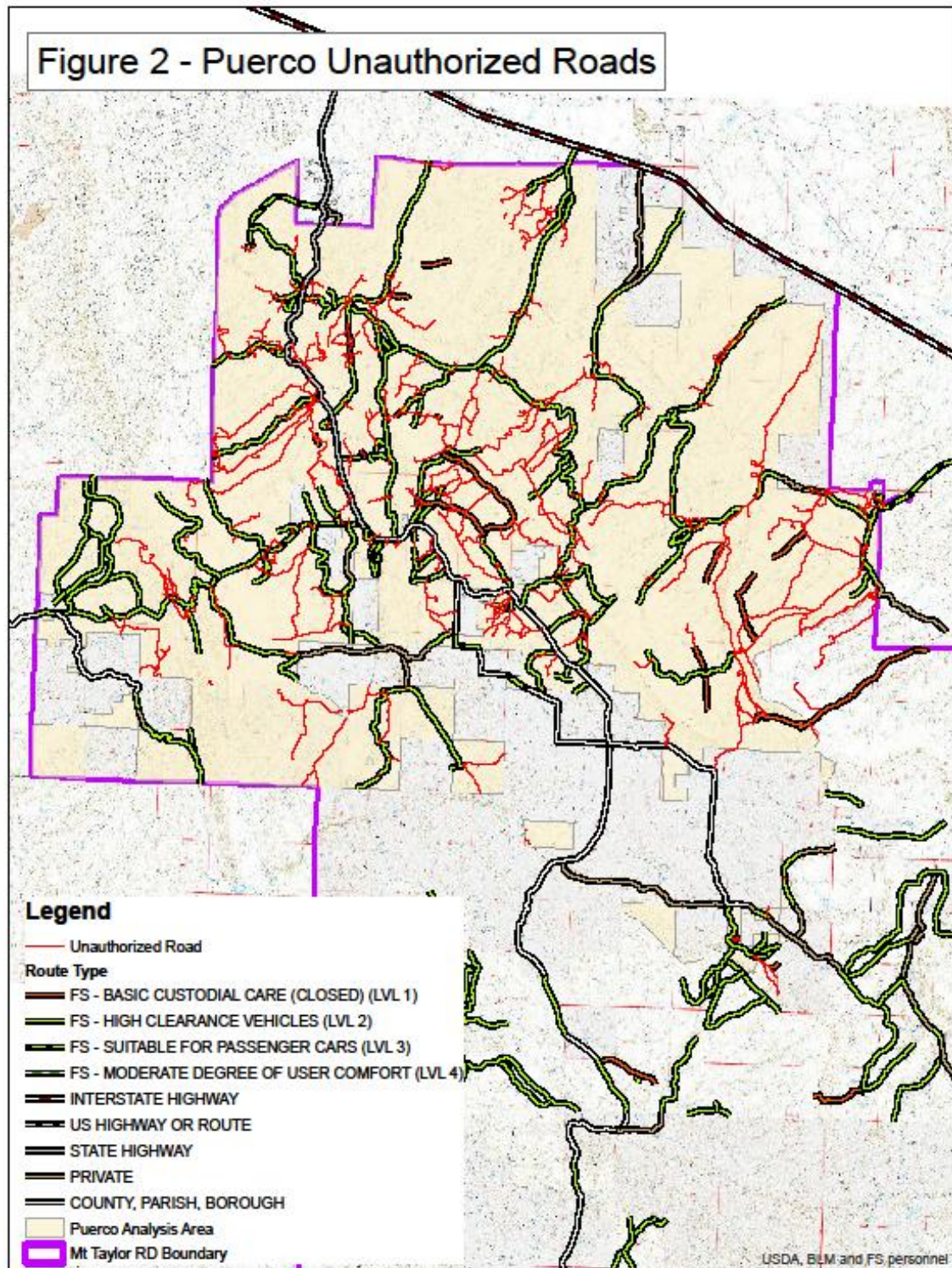


Figure C-3. Travel Management Motor Vehicle Designations

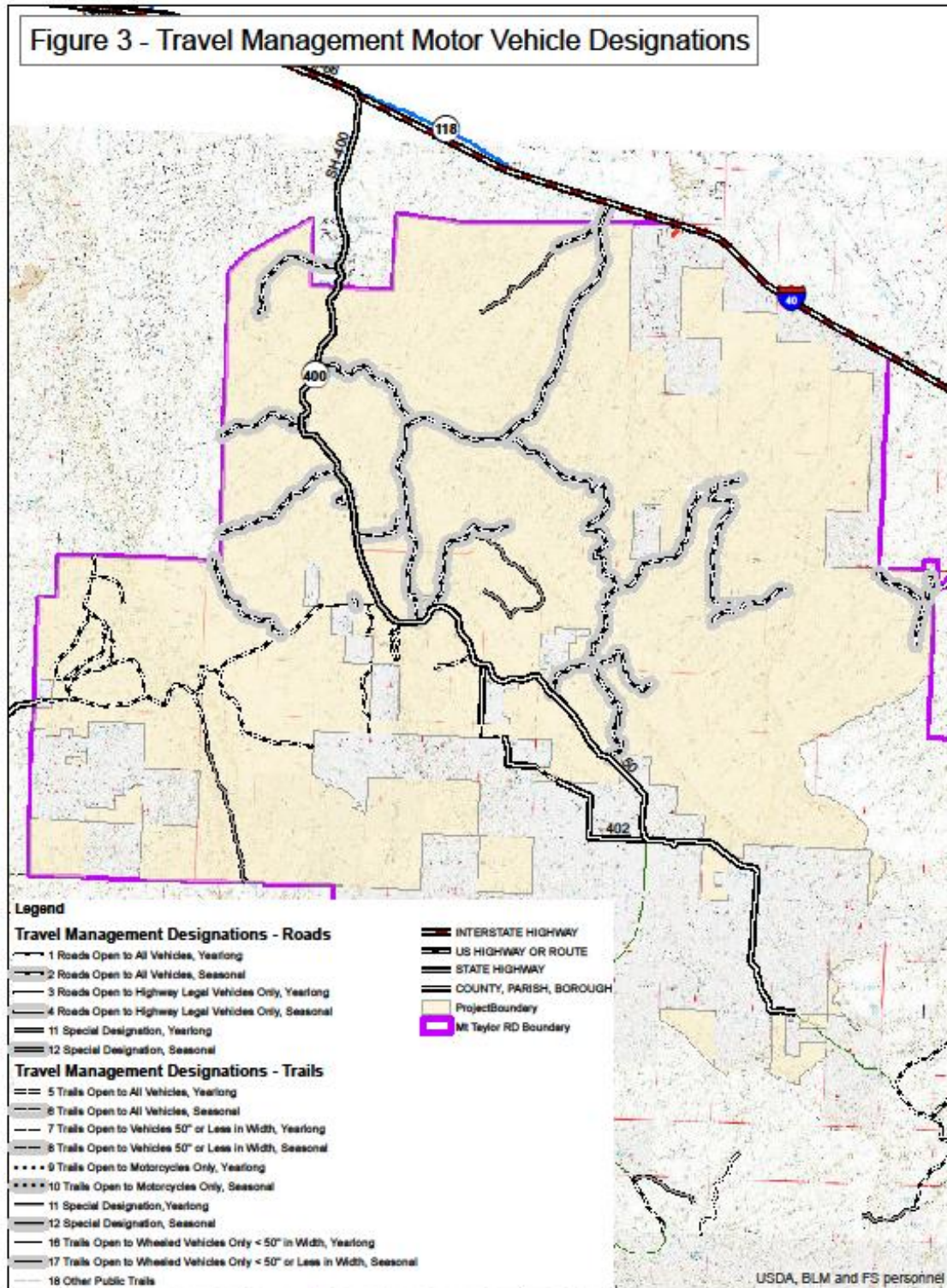


Figure C-4. Seasonal Road Restrictions

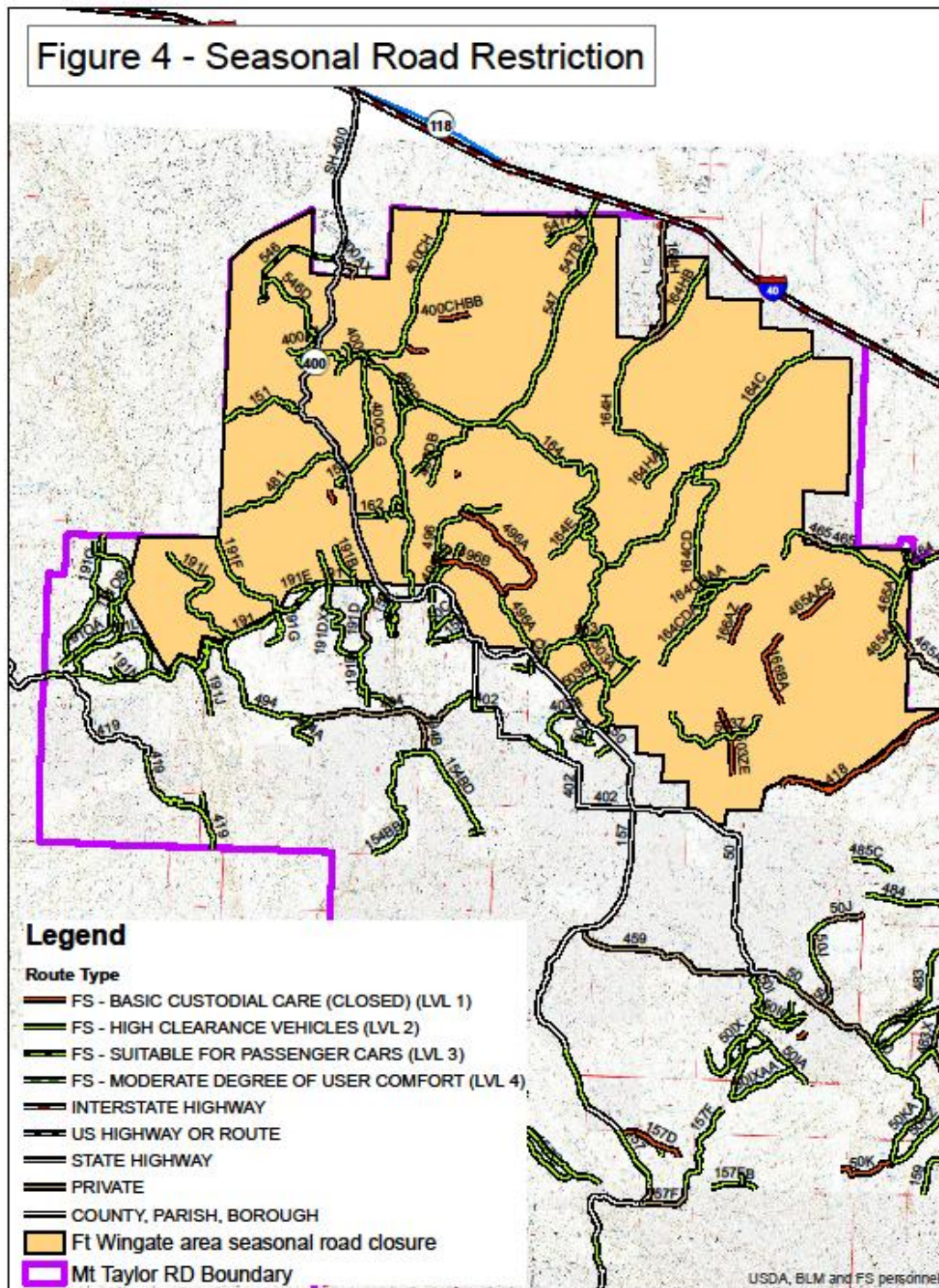


Figure C-5a. Potential Puerco Haul Routes

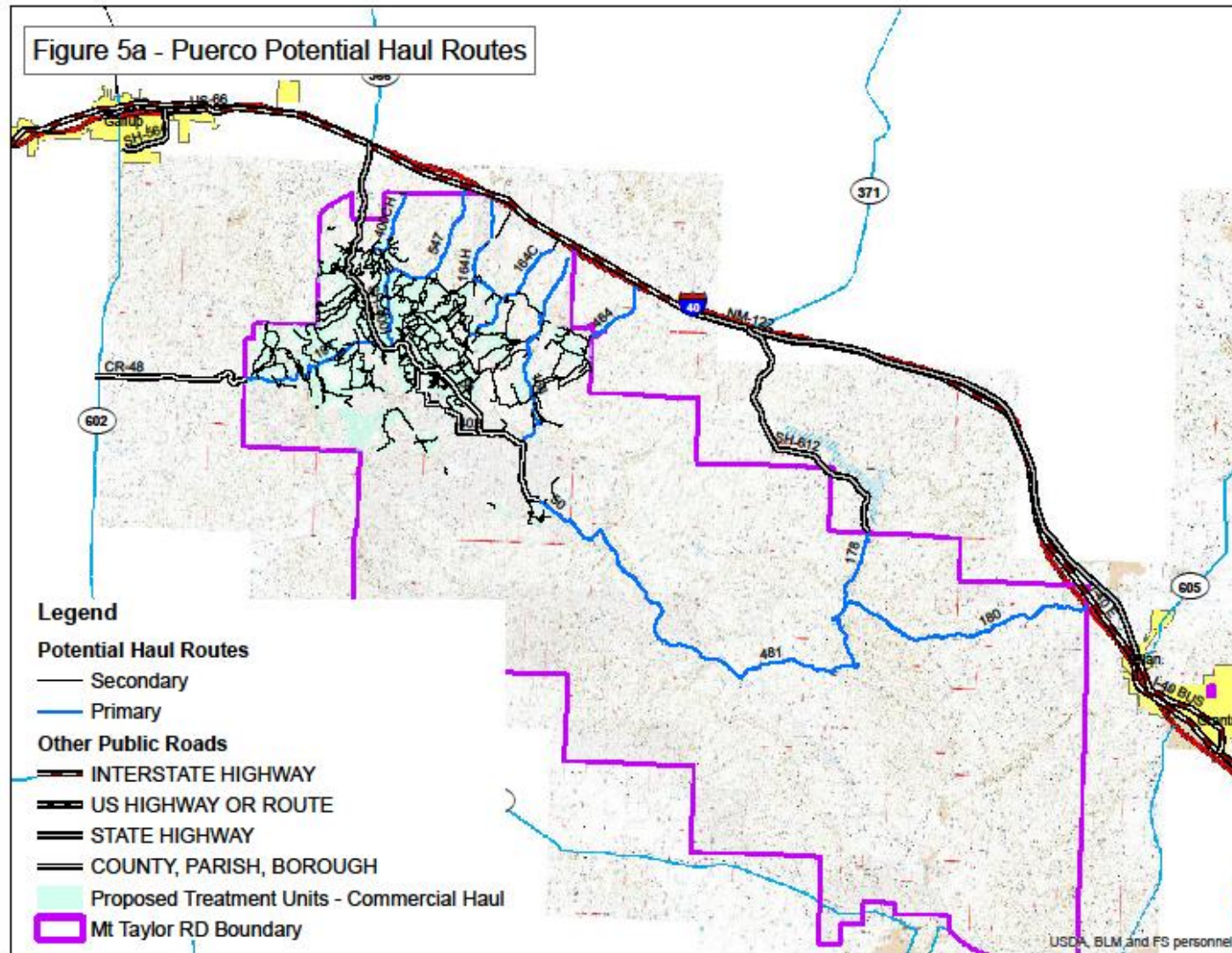
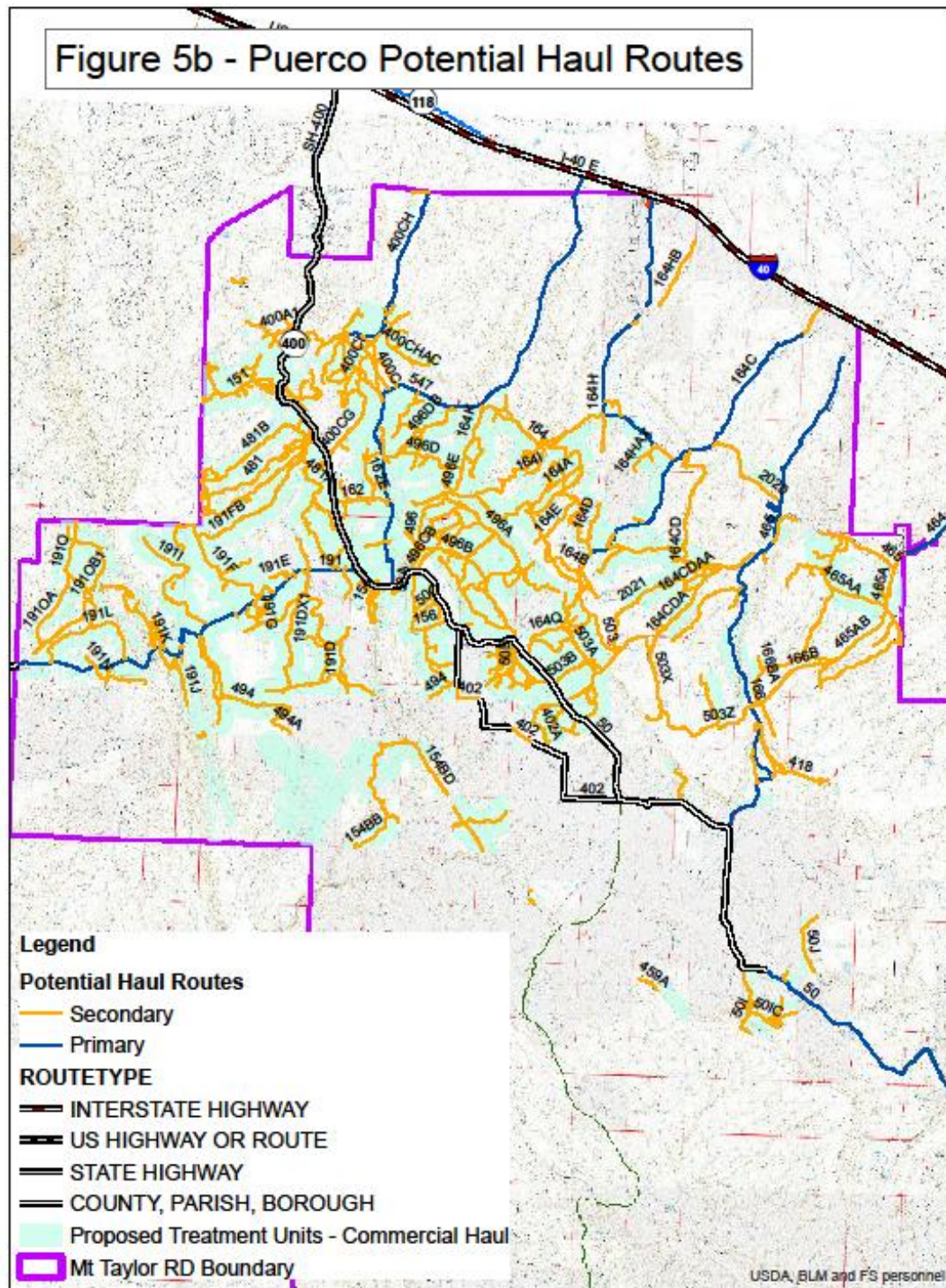


Figure C-5b. Potential Puerco Haul Routes



Appendix D: Best Management Practices

Soil and Water Conservation Practices: Description of general practices can be found in FSH 2509.22 and in the National Best Management Practices for Water Quality Management on National Forest System Lands (USDA 2012). The following are site specific mitigations also known as Best Management Practices (BMP) for the Puerco Project.

Riparian/Stream Protection BMP

1985 Forest Plan Direction:

Stream courses will be designated within timber sales to protect watershed values. The protection will include controls on skidding within riparian areas and along or across designated stream courses. Riparian Areas - Establish buffers or other mitigative measures to protect and maintain and wetland habitat.

Riparian/Stream Protection BMP

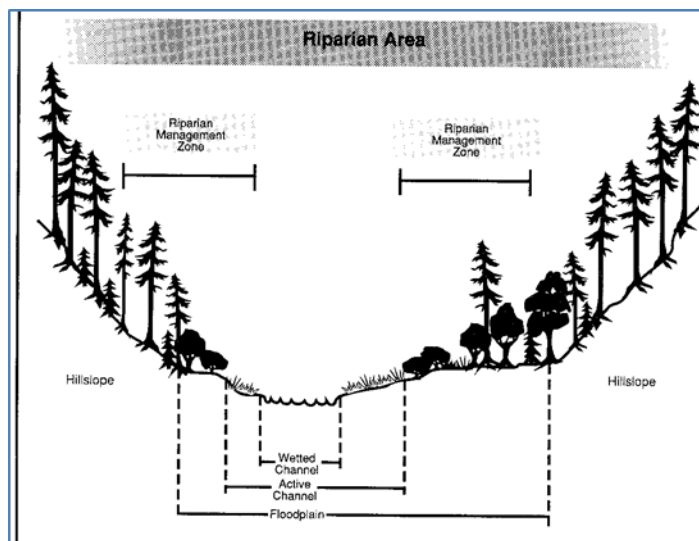
1. Use of Project Area Maps for Designating Water Resource Features

Locations of protected water resource features and their Management Zones will be delineated on the project area and contract maps. Management zones are also referred to as buffers. Management zones are known by the name of the water resource feature being managed. Riparian management zones are located around riparian areas while spring management zones are associated with springs. Designated management areas will be delineated on the implementation documents such as contracts or permits. When project are completed by Forest Service staff, maps will be provided to make sure mitigations are followed. There are some features which are not currently mapped. As these features are recognized, the appropriate specialist will be notified and appropriate mitigations will be incorporated to ensure effects are minimized.

2. Use of Management Zones to Protect Water Resource Features

Stream channels and other water resource features requiring mitigation will be shown on the project maps, along with their associated Management Zones (MZs), also known as buffers. The width of the MZs is measured from the outside edge of the feature as described in the table below and includes the feature itself. With few exceptions, activities within the MZs must benefit the values of the water resource features being protected. Exceptions include locations where stream crossings are needed for preexisting roads, utility corridors, and invasive plant treatments. Specific prescriptions developed for riparian and streams for tree removal may be applied in MZ to benefit the values within these areas and to prevent future degradation. These prescriptions would be developed with the silviculturist and the watershed or biologist to ensure riparian and stream values are being improved. MZ widths may be reduced or increased when approved by the appropriate specialist such as a watershed specialist or biologist to ensure water resource features and associated values are maintained. Stream channels and other water resource features requiring mitigation will be shown on the project maps, along with their associated Management Zones (MZs), also known as buffers. MZs are measured from the outside edge of the feature as described in the table below. With few exceptions, activities within the MZs must benefit the values of the water resource features being protected. Exceptions include locations where stream crossings are needed for preexisting roads, utility corridors, and

invasive plant treatments. MZ widths may be reduced or increased when approved by the watershed specialist to ensure water resource features and associated values are maintained.



Cross section of a lotic riparian area.

Table 1. Management Zone Width (*widths may be reduced or increased when approved by the appropriate specialist, such as a biologist or hydrologist.)

Water Resource Feature	Management Zone Width*	Measurement Edge	Treatment Options – can be adjusted in the field by the appropriate specialist such as a watershed specialist or biologist
Perennial	300 feet	Edge of active floodplain	<ul style="list-style-type: none"> No tree removal within 25 feet of the edge of the active floodplain, except where needed to improve to benefit MZ functions. Large wood placement allowed for restoration as approved See examples and guidelines in table 2.
Intermittent streams	100 feet	Edge of active floodplain	<ul style="list-style-type: none"> No tree removal except to benefit stream functions or as approved for exceptions Large wood placement allowed for restoration as approved See examples and guidelines in table 2.

Water Resource Feature	Management Zone Width*	Measurement Edge	Treatment Options – can be adjusted in the field by the appropriate specialist such as a watershed specialist or biologist
Riparian areas	For perennial water riparian systems 300 feet For intermittent water riparian system 100 feet	Edge of riparian area	<ul style="list-style-type: none"> • No tree removal or cutting except to benefit riparian functions or as approved for exceptions • Large wood placement allowed for restoration as approved • Use TEU and/or RMAP for information on potential and desired conditions • See examples and guidelines in table 2.
Mapped Ephemeral Streams	50 feet	Edge of active floodplain or edge of first break in slope above channel if no floodplain evident	<ul style="list-style-type: none"> • No tree removal except to benefit stream functions or as approved for exceptions. • Large wood placement allowed for restoration as approved • Groups of trees for silviculture prescription are allowed within ephemeral MZs. Where they occur, leave these groups intact without any thinning or treatment except where identified for improvement activities for ephemeral channel values such as stability and flood dissipation. Do not locate these groups in areas of vertical instability such as incisement or gullyng. • See examples and guidelines in table 2.
Unmapped ephemeral streams	25 feet	Edge of active floodplain or edge of first break in slope above channel if no floodplain evident	<ul style="list-style-type: none"> • No tree removal except to benefit stream functions as approved for exceptions. • Large wood placement allowed for restoration as approved • Groups of trees for silviculture prescription are allowed within ephemeral MZs. Where they occur, leave these groups intact without any thinning or treatment except where identified for improvement activities for ephemeral channel values such as stability and flood dissipation. Do not locate these groups in areas of vertical instability such as incisement or gullyng. • See additional examples and guidelines in table 2.
Springs	500 feet	Spring source	<ul style="list-style-type: none"> • No tree removal or cutting except as approved for exceptions or to benefit spring condition • See examples and guidelines in table 2.

Water Resource Feature	Management Zone Width*	Measurement Edge	Treatment Options – can be adjusted in the field by the appropriate specialist such as a watershed specialist or biologist
Wetlands	300 feet	Edge of wetland	<ul style="list-style-type: none"> • No tree removal or cutting except as approved or as approved for exceptions • Large wood placement allowed for restoration as approved or as approved for exceptions • See examples and guidelines in table 2.
Drinking Water Supplies	500 feet	Point of source waters or well	<ul style="list-style-type: none"> • No chemical (such as herbicides, pesticides, fertilizers) use within 500 feet of source waters or well head • No tree removal or cutting except as approved or as approved for exceptions • See examples and guidelines in table 2.

* Management zone width is on each side.

Mitigation common to all MZs

- a) Within MZs for perennial, intermittent, spring, wetland, and drinking water supply, no motorized or heavy equipment will be allowed within the MZ water resource features except at designated temporary crossings with additional mitigations. Exception may be made as determined necessary by the appropriate specialist such as a biologist, soil scientist, or hydrologist. Temporary crossing are allowed for stream features. Other water resource features such as springs, seeps, and wetlands will not be crossed by motorized vehicles unless a crossing already exists. Where temporary crossings are allowed, crossings will be restored and stabilized by the end of the project activities in that area. Multiple crossings should be spaced greater than 500 feet from each other on perennial and intermittent streams. Existing crossings that are part of the road system should be maintained to prevent impacts.
- b) Within MZs for ephemeral drainage, motorized vehicles will not be allowed to drive up and down ephemeral drainages. Where temporary crossings are allowed, multiple crossings should be spaced greater than 300 feet from each other. Existing crossings that are part of the road system should be maintained to prevent impacts.
- c) Debris generated from adjacent treatment activities will be not be placed within MZs and will removed from these areas if it ends up there. Mastication is not allowed in MZs. Large wood such as whole trees may be placed in streams to stabilize and capture sediment where determined to be beneficial by the appropriate specialist.
- d) Lead-out ditches or water-bars should be constructed in such a manner as to divert run-off away from MZs and related water resource features.

Table 2. Management and Operation Guidelines

Water Resource Feature	Objectives, including Forest Plan S&Gs	Potential Practices for Operations within the MZ for Improvement
Forested (woody) Ecosystems (Perennial, Intermittent, Riparian, Springs, or Wetlands)	<ul style="list-style-type: none"> Plant structure (age classes with at least 10% in Sprout, seedling, sapling stage and 10% in mature and over mature) Plant composition (riparian species compose 60% of woody plant composition relative to the potential for site) Water quality (temperature) 	<ol style="list-style-type: none"> 1. Use TEU and/or RMAP type to determine characteristics of potential vegetation. 2. Maintain canopy cover so that shade is at least 80% of natural levels within a stream reach. Achieve through a mosaic of areas that range from open and uncut areas so that at least 80% of natural levels across the stream reach is maintained. 3. Where regeneration of species that require sun to establish is needed (i.e. narrow leaf cottonwood and most willows), open clearings no larger than 50 feet in length can be created. The trees cut for this purpose should be retained in the MZ to provide woody material and protection for new and existing riparian vegetation. 4. See notes under woody material.
	<p>Woody material – adequate woody material, relative to natural levels, to dissipate flood energy, encourage deposition, and create habitat</p>	<ol style="list-style-type: none"> 1. Existing woody material is retained. (Stream cleanout is allowed upstream of culverts and bridges) 2. Additional wood may be added through cutting trees in the MZ. This could be at openings created to encourage riparian plant growth or at locations where wood is currently lacking as long as shade and canopy requirements are met within the stream reach or feature specific MZ such as at a spring. 3. Cut trees could be partially limbed to set into channel and/or floodplain more securely 4. Cut trees could be placed to protect new riparian growth in openings.

Water Resource Feature	Objectives, including Forest Plan S&Gs	Potential Practices for Operations within the MZ for Improvement
	Floodplain function – dissipate energy associated with high flow events	<ol style="list-style-type: none"> 1. MZ width includes the 100 year floodplain 2. Understory and mid-story vegetation is retained. 3. Overstory trees within 100 floodplain is retained except where cut to provide openings for regeneration of riparian plants, to add to woody material and stream stability, or other methods to improve floodplain function and properly functioning condition. See notes under woody material.
	Channel stability	<p>Retain vegetation within 25 feet of the edge of the floodplain of perennial, intermittent streams, wetlands, or springs, or drinking water supply.</p> <p>Retain vegetation within 15 feet of the edge of ephemeral channels.</p>
Herbaceous Includes scattered tree meadows, shrub meadows, wet meadows, dry meadows	<ul style="list-style-type: none"> • Plant structure (age classes with at 10% in mature, also applies to grasses) • Plant composition (riparian species compose 60% of woody plant composition relative to the potential for site) • Water quality (temperature) 	<p>Use TEU information and field observations to determine the type and extent of meadow. Treat meadow with appropriate treatments to the type of meadow. Where riparian plants occur, including grasses and forbs, use management zone widths as described in the woody for improvement activities</p> <p>In shrub meadows with winter fat, it is best to leave it alone – no ground disturbance and no fire.</p>
	<ul style="list-style-type: none"> • Where the potential exists, the area is saturated at or near the surface in relatively frequent events 	<p>Roads, motorized vehicle use, or other compacted surfaces such as temp roads or skid trails will be located so that runoff is not concentrated into meadows. Areas of compaction related to operations should be restored after use to prevent increased runoff into meadows to prevent gully formation.</p>

Water Resource Feature	Objectives, including Forest Plan S&Gs	Potential Practices for Operations within the MZ for Improvement
	<ul style="list-style-type: none"> Adequate vegetative cover appropriate to the type of meadow exists to dissipate the energy of overland flow 	Retention of woody plants according to TEU and/or RMAP. Keep a few areas at boundary between meadow and upland that are intact to provide for corridors for wildlife and reduce runoff and erosion. Where soil condition is impaired or poor in meadows which should not have trees, leave slash from trees on the ground to protect meadow vegetation.

The term ‘meadow’ generally refers to openings in the forest where trees do not grow. They can be dominated by grasses, forbs, or shrubs. Sometimes there are scattered trees within the meadow. There are meadows that are more permanent on the landscape due to the soil, hydrology, aspect, and other factors. These meadows can be identified by the TEU data. There are other meadows, usually smaller, related to disturbance. These meadows are short term and should not be maintained.

3. Treatment of Ephemeral Drainages

Objectives for ephemeral drainages are to provide for or to retain sufficient amounts of canopy cover, ground cover, and stabilizing components such as roots, rocks, and woody material to maintain channel stability and prevent down cutting.

Ephemeral drainages are recognized in the following ways. They form the lowest spot of the surrounding ground. They form channel continuity along its length and join with larger channels downstream. Ephemeral drainages may or may not have an active scoured channel associated with them. Where there is the risk of incisement, gully formation, or gully extension where soil condition is impaired or unsatisfactory, these features will be protected by retaining trees within 25 feet to provide canopy cover, reduce rainfall impact, and tree root structure

There are two types of ephemeral channel mitigations. These include mapped ephemeral channels known prior to project implementation and those ephemeral channels that were not recognized prior to project implementation. Generally, the mapped ephemeral channels are the larger feature while the unmapped channels are smaller. Mapped ephemeral channels are included on the mitigation map and GIS file but could be identified in the field. To assist in project implementation, additional mitigations for the unmapped ephemeral channels are prescribed when significant features are recognized during project implementation. Significant unmapped ephemeral channels include those that exhibit gully formation or active channel scouring. These mitigations are meant to be easily implemented during project work while

maintaining the integrity of these features including soil productivity. It is these features which have the potential to result in soil loss through channel formation and erosion of soil.

4. Log Landing Location

Log landings (or decking areas), temporary mill sites, or similar activities are not allowed within water resource feature Management Zones (MZ). Landings will be located on slopes less than 15% and avoid areas with severe erosion hazard. Erosion and sediment control measures will be implemented around landings or decking areas to prevent loss of soil, sedimentation, and concentrated runoff.

5. Slash Treatments in Sensitive Areas

Slash piling shall not occur in MZs. Large wood can be placed as appropriate with the input of the watershed specialist to encourage improvements in stream condition. Mastication is not allowed in the 100 year floodplain. Outside of the floodplain, mastication or chipping could occur in small pockets (less than 50 ft²) if it is determined that this activity is needed for MZ improvement or for safety reasons.

6. Prescribed Burning Treatments

To maintain the sediment filtering capacity of management zones (MZs), reduce erosion, and retain long term soil productivity, several BMPs are indicated.

- a) Burn to allow for low to moderate burn intensities.
- b) Ignition should be outside of the MZs.
- c) Burn piles will be located outside of the MZ.

7. Servicing and Refueling Equipment

During servicing or refueling of equipment, pollutants shall not be allowed to enter any MZs, including riparian areas and streams. Select service and refueling areas outside of the MZs and well away from other wet areas as seen on the ground. Construct berms or similar containment measures around such sites to contain potential spills. Spill prevention, containment and countermeasures (SPCC) plans are required if the oil of any kind or in any form (including fuel) exceeds 660 gallons in a single container or if total storage at a site exceeds 1320 gallons. The SPCC plan shall be submitted to the project administrator and the Forest Hazmat Coordinator prior to any operations or storage of materials. The project contract administrator shall designate the location, size and allowable uses of service and refueling areas. The authorized FS Officer shall be aware of actions to be taken in case of a hazardous substance spill.

The contractor shall take all reasonable precautions to prevent pollution of all National Forest soil and water. Equipment operators shall maximize the recovery and proper disposal of all fuels, fluids, lubricants, empty containers and replacement parts. Refuse resulting from the contractor's use, servicing, repair or abandonment of equipment shall be removed from National Forest system lands by the contractor to the appropriate disposal facilities. Any leaks originating from contractor equipment shall be repaired or the

equipment replaced in a timely manner and reported to project administrator for any follow-up remediation actions required.

Upland related BMPs

1. Limit the Operating Season

Ground disturbing activities from motorized vehicles or heavy equipment shall be limited to dry or solidly frozen soil conditions to reduce compaction and soil displacement (rutting) that is associated with tree removal activities when soils are wet or are saturated.

2. Erosion Prevention and Control

- a. Immediately after use, areas where compaction and bare soil are present such as landings, skid roads, temporary roads, and masticator tracks will be treated to prevent soil degradation, stabilize the sites, and restore soil productivity. This includes decompaction treatments as needed to eliminate compaction and water bars to disperse runoff. In addition, these areas could be mulched and seeded with an erosion control seed mix consisting of primarily native species. Other treatment to restore function are also possible
- b. Slash or chips could be scattered on these areas to further retard formation of rills and gullies. If existing rills are present, these rills will be broken down prior to erosion control treatments.
- c. Construct and maintain the appropriate erosion control features on and adjacent to roads and disturbed areas such as skid trails or similar features created by multiple passes with motorized equipment.
- d. Heavy equipment should be limited to use on slopes 40% or less.

4. Soil Productivity/Coarse Woody Debris

To maintain or improve soil productivity woody material should be left on the ground at levels appropriate to the vegetation type. This should include a distribution of size classes and decay classes. Retain wood in an advanced state of decay. Masticated material depth should generally not exceed 3 inches. Masticated material should be discontinuous at least at the .25 acre scale.

5. Machine Piling of Slash

Do not use soil disturbing methods to pile slash. Minimize the use of slash piles. Do not place slash piles within MZs. When possible, burn slash piles in the winter. Piles will be generally be less than 10 feet by 10 feet and composed of a variety of size classes with large wood distributed throughout the pile. Large wood should not be concentrated on the bottom to prevent excessive soil heating. Restore the soil underneath piles after burning, if needed.

6. Minimize ground disturbance

- a) No more than 15% of the project area should have new ground disturbance that results in impaired or unsatisfactory soil condition.
- b) When managing for groups of trees, at least 25% of the groups should be left completely undisturbed to maintain soil conditions. This means no trees will be removed, no mechanized or motorized activities, and ground cover is intact.

7. Prescribed Burning Treatments

- a) Schedule burning when the soil moisture conditions will minimize heat conductivity into the soils and result in low to moderate burn levels.
- b) Fire control lines on slopes greater than 40% or within designated shall be constructed by hand. Exceptions will be approved by local District Ranger with input from specialists. Fire lines will be treated as needed (waterbars, seeding etc.) to prevent concentrated water flows and erosion.

Monitoring for Best Management Practices

The desired result of BMP monitoring is to document that BMPs have been applied as prescribed and that they appear effective in reducing sediment and moderating flow regimes in forest streams. BMPs that are found to be ineffective in protecting identified resource, aquatic and water quality goals will be adjusted. BMPs will be monitored using the National Best Management Practices for Water Quality Management on National Forest system Lands (USDA FS, 2012). This protocol randomly selects project across the forest to assess for implementation and effectiveness of BMPs. This shows the overall implementation and effectiveness of projects across the forest, leading to improvement in BMPs.

Appendix E: Response to Comments on the Draft Environmental Assessment

Response to Comments for the Draft Environmental Assessment for the Puerco Collaborative Forest Landscape Restoration Project

The scoping letter for the Puerco Collaborative Forest Landscape Restoration project was mailed to approximately 150 individuals and organizations, and added to the PALS website on July 31, 2017. Concerns and comments regarding the project were requested by August 29, 2018. The Forest received 10 responses and after reviewing them with the ID Team, it was determined that none of the comments were substantive enough to drive additional analysis or alternatives.

Table E-1. List of commenters on the DEA

Name	Date	Identification
Hopi Tribe	08/06/2018	1
Dick Artley	08/12/2018	2
R. Siegmann	08/18/2018	3
Sue Small, Conservation Chair, NPSNM Albuquerque Chapter	08/22/2018	4
NM Wildlife Federation	08/27/2018	5
NM Game & Fish Dept.	08/29/2018	6
Center for Biological Diversity	08/29/2018	7
Marina Bean	08/29/2018	8
Brant Hayenga	08/29/2018	9
Susan Ostlie	08/29/2018	10

Table E-2. Comments received during scoping and responses

1 – Hopi Tribe	
	<p>Summary/Comment: <i>“The Hopi Cultural Preservation Office requests consultation on any proposal on the Mount Taylor Ranger District with the potential to adversely affect prehistoric archeological sites. If prehistoric sites are identified that will be adversely affected by project activities, please provide us with copies of the cultural resources survey of the area of potential effect and any proposed draft treatment plans for review and comment. In addition, we recommend that if any prehistoric cultural features or deposits are encountered during project activities, these activities must be discontinued in the immediate area of the remains, and the State Historic Preservation Office must be consulted to evaluate their nature and significance. If any Native American human remains or funerary objects are discovered during construction they shall be immediately reported as required by law.”</i></p> <p>Response: The Cibola National Forest and National Grasslands consults with all local tribes, including the Hopi, on any undertaking that could adversely affect cultural resources. This project is designed to have no adverse effects to cultural properties or resources, but in the event that a situation arises where it is not feasible to avoid adverse effects, we will follow the process for the resolution of adverse effects outlined in 36CFR 800.</p> <p>We follow NAGPRA standards when encountering any human remains and consult upon discovery, along with ceasing operations until consultation is concluded and their nature and significance has been evaluated.</p>
2 – Dick Artley	
	<p>Summary: <i>“Please accept and consider these comments on the proposed Puerco Collaborative Forest Landscape Restoration timber sale pre-decisional EA and read them with an open mind. Remember, future generations of kids will seek out undeveloped forest land for solitude and quietness in a new America with a population that’s double what we have now. Of course you don’t care.”</i></p> <p><i>“Mr. Hattenbach, you support Ranger Whitehair’s proposal to “mechanically treat” (a.k.a. commercially log) 113.5 square miles Table 2.2 (pg. 31). You cannot comprehend 113 square miles. This is a vicious assault on the land owned by 324 million Americans. Your motive is clear. You know USFS employees must exhibit extraordinary skills at generating maximum volume. You know agency employees are promoted only if they have these skills. USFS employees who fail to please their corporate masters with volume attainment opportunities have no future in an agency with an overriding timber agenda. It’s sad that some of your shiny-faced IDT members don’t know this and still think the USFS can do no wrong and really serves the public.”</i></p> <p><i>“Your scoping letter is written to “friends of the Cibola NF.” I suggest you hire someone with basic NEPA knowledge of NEPA. This is not a scoping letter. After you propose this tragic timber sale the only friends of the Cibola NF will be those who work in the timber</i></p>

	<p><i>industry. The people who visit your forest for recreation will curse you.”</i></p> <p><i>“Your witless, unprecedented timber sale will guarantee your infamy.”</i></p>
	<p>Response: Thank you for your interest and participation in this project. In addition to the opening summary above, Mr Artley’s comments include another 26 pages, including some project-related comments and opposing science.</p> <p>On page 10 of Mr. Artley’s comment, he states <i>“The comments on this proposed timber sale are clearly labeled. They are indented using the word Comment that’s bold, purple, Arial font, and underlined. The text of all the comment is bold green, Arial font. Please prepare <u>meaningful</u> (emphasis added) responses to <u>all</u> (emphasis added) of my comments and include them in the final EA in the “Response to Comments” section.</i> In addition, five attached documents with “opposing science” and signature page were received.</p> <p>Meaningful responses have been prepared for all comments, and they have been included in the Response to Comments section of the Final EA.</p>
2a	
	<p>Comment: <i>Of course the Puerco Restoration timber sale is not a REAL restoration project.</i></p> <p><i>It’s sad that so many USFS employees fall for this absurd agency claim. They are afraid to think outside the USFS box and really examine agency “truths.” Supervisor Hattenbach, you mindlessly call this timber sale a restoration project. You do not know Webster’s definition of “restoration” yet you use the term anyway.</i></p> <p><i>“a bringing back to a former position or condition”</i> <i>“restoring to an unimpaired or improved condition”</i></p> <p><i>The draft EA EIS does not identify which natural resources will be restored, how logging and roading will restore them and how you determined the “former condition.”</i></p>
	<p>Response: From <i>Restoring Composition and Structure in Southwestern Frequent-Fire Forests: A science-based framework for improving ecosystem resiliency (2013)</i>, the Glossary definition of Ecological restoration is the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed. Restoration initiates or accelerates ecosystem recovery with respect to its health (productivity), processes, and functions (biodiversity, food webs, and sustainability) (adapted from Society for Ecological Restoration 2004).</p> <p>The draft EA (DEA) clearly identifies which natural resources will be restored:</p> <ul style="list-style-type: none"> • Hand thin and lop and scatter slash without prescribed fire to improve soil condition by improving ground cover and woody material on approximately 23,087 acres.

	<p>(DEA page 1)</p> <ul style="list-style-type: none"> • Rehabilitate up to 200 miles of unauthorized roads. (DEA page 1) • Improve road drainage and crossings. (DEA page 1) • Restore approximately 19 springs. (DEA page 1) • Restore up to 250 acres of riparian areas including associated stream habitats for threatened, endangered, and sensitive aquatic species. (DEA page 1) • Improve the function of streams, including gullies. (DEA page 1) • Construct protective barriers around springs, aspen, and willows as needed for protection of approximately 300 acres. (DEA page 1) <p>Additionally, beginning on page 4 of the DEA, Purpose and Need for Action (DEA pgs. 4-6), the purpose, need, and which natural resources to be restored are described in further detail.</p> <p>The purpose of the Puerco Project is to reestablish and restore forest structure and pattern, forest health, and vegetation composition and diversity in forest ecosystems to conditions within the natural range of variability, thus moving the project area toward the desired conditions. The outcome of improving structure and function is increased ecosystem resiliency. Resiliency allows for the ability of an ecological system to absorb disturbances, such as fire, insects and disease, and climate change, while retaining the same basic structure and ways of functioning and the capacity to adapt to stress and change (FSM 2020.5). This project is needed to:</p> <ul style="list-style-type: none"> • Increase forest, shrubland and grassland resiliency, sustainability • Reduce the risk of uncharacteristic fire effects • Improve wildlife and aquatic species habitat • Improve the condition and function of watersheds • Improve the condition and function of riparian areas, wet meadows, streams, and springs • Preserve cultural resources
2b	
	<p>Comment: Supervisor Hattenbach, people who understand forest ecology and the conditions necessary for natural resources to function properly who gaze upon the natural resource plunder caused by commercial timber sales would find it laughable you call this a “restoration” project.</p>
	<p>Response: As described above, the Cibola National Forest is proposing this restoration project consistent with the best available science regarding restoration of these ecosystems.</p>
2c	
	<p>Comment: Supervisor Hattenbach, what are your qualifications that permit you to ignore the conclusions of USDA Office of Inspector General scientists? In 2001, OIG scientists said this:</p> <p>“We concluded that commercial timber sales do not meet the criteria for forest restoration.” (Pg. 11)</p>

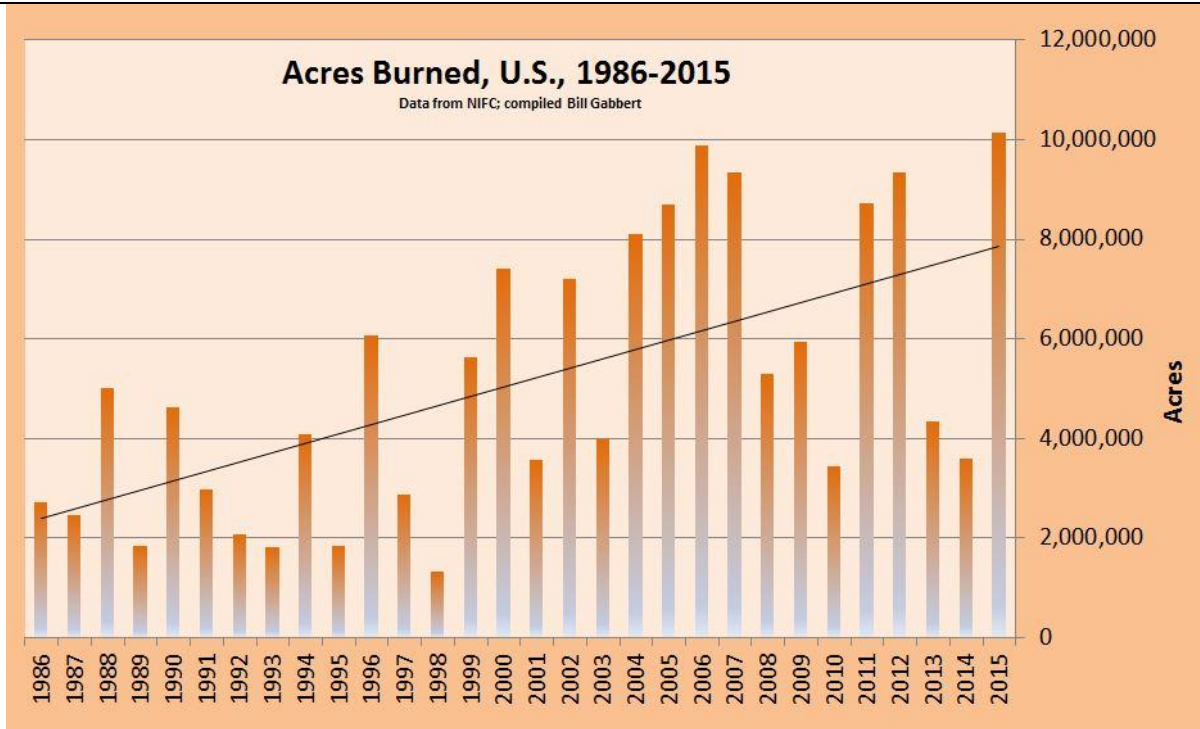
	<p>Long, Richard D., U.S. Department of Agriculture Office of Inspector General "Western Region Audit Report: Forest Service National Fire Plan Implementation" Report No. 08601-26-SF, November 2001. http://www.usda.gov/oig/webdocs/08601-26-SF.pdf</p>
	<p>Response: This quote does not discuss or pertain to this project. The quote referred to is taken out of context. The context in which the Forest Restoration is used in the passage quoted by Mr. Artley is post-fire restoration, which is clearly spelled out on page 10 of the article cited:</p> <p>“The rehabilitation and restoration program is one of four primary program areas in the National Fire Plan (NFP) that directly relates to the FY 2001 Appropriations Act. The goal of the rehabilitation and restoration program is to rehabilitate and restore watersheds that were severely burned in FY 2000 in order to closely match historical or pre-fire ecosystem structure, function, diversity, and dynamics.</p> <p>The quote is in reference to fiscal accountability of forest restoration funding, not the actual implementation of forest restoration treatments or the science behind restoration treatment design:</p> <p>“The FS had not established controls to ensure that funds designated to rehabilitate and restore acres burned by the wildfires of 2000 were being properly used. In Region 1, we questioned the propriety of using approximately \$2.5 million of rehabilitation and restoration program funds to (1) prepare for projects that include commercial timber sales, (2) administer permits to harvest mushrooms, and (3) rehabilitate and restore areas burned in 1998.”</p>
2d	<p>Comment: <i>Supervisor Hattenbach, what are your qualifications that permit you to ignore the conclusions of Dr. Thomas Michael Power? Dr. Power received his PhD in Economics from Princeton University. From 1968 to 2008 he was a professor in the Economics Department at the University of Montana. From 1978 to 2008 he served as Chairman of the Economics Department specializing in natural resource and environmental economics. In 2008 he retired from teaching and administration and now serves as a Research Professor and Professor Emeritus.</i></p> <p><i>He is the author of six books, and numerous articles and reports in the field of Natural Resource and Regional Economics. He has regularly testified before state and federal regulatory agencies. Here’s one of many natural resource-related quotes authored by Dr. Powers:</i></p> <p><i>“Commercial logging is not a prescription for forest health; it is one of the major causes of</i></p>

	<p><i>unhealthy forest conditions. Until the forest products industry stops trying to insist that clearcutting our public lands is necessary for the health of those lands, we will make no progress in restoring those lands. Equating forest health with timber company profits condemns our forests to either the commercial ravages of the past or the management paralysis of the present. Both are bad for our forests and for those of us who have chosen to live in beautiful, but naturally dangerous, forested landscapes.”</i></p> <p>“The Politics of Forest Fires -- The Abuse of Other People's Hard Times” A paper by Power, Thomas Ph.D., 8/15/2000 http://www.forwolves.org/ralph/tompower.htm</p>
	<p>Response: These quotes do not discuss or pertain to restoration treatments generally or the site specific concerns of this project specifically. The Puerco Project does not propose clearcutting and does not involve commercial logging in the traditional sense as described by Dr. Powers in this quote. The Cibola National Forest has just renewed its 10-year stewardship agreement with the National Turkey Federation to restore frequent fire forests and improve wildlife habitat. Stewardship Agreements provide for the mutual interest and benefit of the land management agency and a partner (which can be a state or local government, tribe, and/or non-profit). https://www.nationalforests.org/assets/files/Stewardship-Authority-Overview_2014-7-24.pdf</p> <p>Congress created the stewardship program to give the U.S. Forest Service (USFS) and Bureau of Land Management (BLM) the authority “to perform services to achieve land management goals for the national forests and the public lands that meet local and rural community needs.” The seven land management goals include:</p> <ul style="list-style-type: none"> • road and trail maintenance or obliteration to restore or maintain water quality; • soil productivity, habitat for wildlife and fisheries, or other resource values; • setting of prescribed fires to improve the composition, structure, condition, and health of stands or to improve wildlife habitat; • removing vegetation or other activities to promote healthy forest stands, reduce fire hazards, or achieve other land management objectives; • watershed restoration and maintenance; • restoration and maintenance of wildlife and fish habitat; and • control of noxious and exotic weeds and reestablishing native plant species.
2e	
	<p>Comment: Request for changes to be made to the final NEPA document: 1) Indicate which resources will be restored, 2) why they need restoration, 3) the natural resources in the area that could be harmed by the timber sale treatments and 4) include specific independent science that shows logging and roading the sale area will achieve natural resource restoration.</p>
	<p>Response: See Response 2a for which resources will be restored and why they need</p>

	restoration. See Chapter 3 – Environmental Consequences of the DEA, pages 65-205 for analysis of any potential adverse impacts from the proposed action on natural resources within the project area, and see the Literature Cited Section (DEA, page 209) for the best available science. This project does not include the construction of new roads or temporary roads.
2f	
	Comment: <i>One of your fellow USFS employees’ research conclusions indicates fine fuels removal is far superior to commercial hazardous fuels logging farther away from the WUI than 100 yards, yet your draft EA EIS doesn’t mention Dr. Cohen’s research conclusions. Dr. Cohen states several times in the many scientific papers he authored that commercial fuels removal farther than “100 to 200” feet from the WUI is ineffective. Why then do you propose widespread fuels logging? Of course I know the answer ... you want the volume.</i>
	Response: The cited paper does not pertain to restoration treatments generally or the site specific concerns of this project specifically. Dr. Cohen’s conclusions surrounding application of fine fuels removal versus commercial hazardous fuels logging are associated with objectives surrounding protecting communities/values at risk in the Wildland Urban Interface (WUI). As identified in the DEA, there is a need to reduce tree densities across the landscape, not just in the WUI. The purpose of the proposed activities are to restore and maintain a resilient, fire-adapted ecosystem, which requires a much broader application of management tools to achieve. See the response to comment 2a for the additional needs above and beyond protecting WUI.
2g	
	Comment: <i>Pretending to pass a project through the NEPA process with only 1 action alternative (the Proposed Action) makes a mockery of the National Environmental Policy Act. A “do it” or “don’t do it” NEPA analysis is not a NEPA analysis but a justification of the Proposed Action. There are alternatives ways to accomplish any goal.</i>
	Response: Per applicable statute and regulations – only one action alternative is required to be considered in this EA, which is why on March 14, 2017, a scoping letter with links to a detailed Proposed Action was mailed to approximately 145 different agencies, businesses, individuals, tribes, and organizations interested in or determined to be potentially impacted by the proposed project. Section 1.7 – Public Involvement, starting on page 24 of the DEA, details all the steps taken to involve the public and adjust or modify the proposed action. As per the Forest Service Handbook 1909.15, section 41.22 Proposed Action and Alternatives, the EA must include the proposed action and alternative(s) that meet the need for action; further, within an EA, “no specific number of alternatives is required or prescribed” (36 CFR 220.7(b)(2)).
2h	
	Comment: <i>Larry Freeman, the Senior Consultant for the Shipley Group that the USFS contracts to teach the NEPA process states: “A single action alternative is a risky agency choice, especially if you determine that your EA or EIS is likely to be a high- risk and</i>

	<p><i>controversial document.” Link to Mr. Freeman’s comment: http://www.shipleygroup.com/news/articles/0911.pdf</i></p> <p><i>36 CFR 220.7(b)(2)(i) states: “When there are no unresolved conflicts concerning alternative uses of available resources (NEPA, section 102(2)(E)), the EA need only analyze the proposed action and proceed without consideration of additional alternatives.” NEPA Section 102(2)(E) states “study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources.”</i></p> <p><i>The vast majority of the scoping comments submitted by the public are critical of the project and suggest changes in the Proposed Action. Therefore to comply with NEPA you must analyze another action alternative that is more ecosystem friendly and has much less adverse natural resource impact than the Proposed Action.</i></p>
	<p>Response: Mr. Artley’s generalized statements do not address this project specifically. As you note in your comment, per applicable statute and regulations – only one action alternative is required to be considered in this EA. Your comment that <i>“The vast majority of the scoping comments submitted by the public are critical of the project and suggest changes in the Proposed Action”</i> is incorrect. From Section 1.8 - Issues of the DEA on pages 26-27: A total of 6 comments were received on the Puerco Collaborative Restoration Project. From the public comments received, the Forest Service did not identify any issues that would drive the analysis of any alternatives other than the Proposed Action and No Action Alternatives. Internal comments brought to light that a significant portion of the project area located on sensitive soils (Chinle Formation) had been proposed for thinning and burning treatments. Because these soils are in unsatisfactory condition with severe hazard, the proposed action has been modified to omit burning and limit thinning treatments to be done only by hand to protect the soil. See response to comment 2g.</p>
2i	
	<p>Comment: <i>Please don’t ignore the Shipley Group NEPA recommendations as you prepare your final EA. The USFS spends millions of dollars to hire this company to teach agency employees how to apply the NEPA process correctly? Supervisor Hattenbach, are your qualifications comparable to Dr. Freeman who works for the Shipley Group? They must be for you to ignore Dr. Freeman’s advice that “A single action alternative is a risky agency choice, especially if you determine that your EA is likely to be a high- risk and controversial document.” Link to Mr. Freeman’s comment: http://www.shipleygroup.com/news/articles/0911.pdf</i></p> <p><i>The scoping comments are highly critical of this timber sale.</i></p>
	<p>Response: See response to comments 2g and 2h.</p>
2j	

	<p><i>Comment:</i> <i>The public does not want natural resources in their public land that will be inherited by future generations to be destroyed in order to provide corporate profit opportunities. Opposing Views Science Attachment #10 gives you the results of 16 statistically significant nationwide polls revealing the public’s feelings about national forest logging. Depending on the poll between 63% and 81% didn’t want logging. You propose to log **** square miles. How can you justify calling yourself a public servant? In reality you are serving your corporate masters.</i></p>
	<p><i>Response:</i> None of the cited polls discuss or pertain to restoration treatments generally or the site specific concerns of this project specifically. The polls cited are not relevant to issues affecting forest management in the southwestern U.S. because 15 out of the 16 polls were taken in 2003 or earlier, and only 3 could be possibly linked to public interest from NM or AZ:</p> <ul style="list-style-type: none"> • Americans randomly selected in the lower 48 states (2002) • Registered voters in the Western United States (1999-2000) • Registered voters 5 Rocky Mountain states (2011) <p>Public perceptions on wildfire and forest restoration are different in regions of the U.S. where forests evolved under frequent fire regimes (0-35 year fire return interval), such as ponderosa pine and dry mixed conifer forests of the western united states. Comparing outdated polls on ‘logging’ from residents of New England, Vermont, Nova Scotia, North Carolina, Georgia, and Ohio is hardly relevant to the restoration treatments of fire adapted southwestern forests. See below for more current and relevant information:</p> <p>Fires in western forests began increasing abruptly in the 1980s, as measured by area burned, the number of large fires, and length of the fire season. The increases have continued, and recently scientists and public officials have in part blamed human-influenced climate change (Gabbert 2018, https://wildfiretoday.com/tag/statistics/)</p>



From Climate Central (2012):

<http://www.climatecentral.org/wgts/wildfires/Wildfires2012.pdf>

Analysis of 42 years of U.S. Forest Service records for 11 Western states shows that:

The number of large and very large fires on Forest Service land is increasingly dramatically. Compared to the average year in the 1970's, in the past decade there were:

- 7 times more fires greater than 10,000 acres each year
- Nearly 5 times more fires larger than 25,000 acres each year
- Twice as many fires over 1,000 acres each year, with an average of more than 100 per year from 2002 through 2011, compared with less than 50 during the 1970's.

In some states the increase in wildfires is even more dramatic. Since the 1970's the average number of fires over 1,000 acres each year has nearly quadrupled in Arizona and Idaho, and has doubled in California, Colorado, Montana, New Mexico, Nevada, Oregon, Utah and Wyoming.

On average, wildfires burn twice as much land area each year as they did 40 years ago. In the past decade, the average annual burn area on Forest Service land in the West has exceeded 2 million acres – more than all of Yellowstone National Park.

The burn season is two and a half months longer than in the 1970s. Across the West, the first wildfires of the year are starting earlier and the last fires of the year are starting later, making typical fire years 75 days longer now than they were 40 years ago.

	<p>Comment: <i>Request for changes to be made to the final NEPA document: Include some source documents from the Opposing Views Science Attachments in the References/Literature Cited section, and also, cite the applicable specific quotes presented in the Opposing Views Science Attachments.</i></p> <p><i>Failure to do so will violate 40 CFR 1500.1(b) and (c) and 40 CFR 1500.2(e) and (f)</i></p>
	<p>Response: The sections from 40 CFR are listed below. The Cibola National Forest has met the requirements cited without including some source documents from the Opposing Views Science Attachments.</p> <p>1500.1 Purpose.</p> <p>(b) NEPA procedures must insure that environmental information is available to public officials and citizens before decisions are made and before actions are taken. The information must be of high quality. Accurate scientific analysis, expert agency comments, and public scrutiny are essential to implementing NEPA. Most important, NEPA documents must concentrate on the issues that are truly significant to the action in question, rather than amassing needless detail.</p> <p>(c) Ultimately, of course, it is not better documents but better decisions that count. NEPA's purpose is not to generate paperwork - even excellent paperwork - but to foster excellent action. The NEPA process is intended to help public officials make decisions that are based on understanding of environmental consequences, and take actions that protect, restore, and enhance the environment. These regulations provide the direction to achieve this purpose.</p> <p>1500.2 Policy.</p> <p>(e) Use the NEPA process to identify and assess the reasonable alternatives to proposed actions that will avoid or minimize adverse effects of these actions upon the quality of the human environment.</p> <p>(f) Use all practicable means, consistent with the requirements of the Act and other essential considerations of national policy, to restore and enhance the quality of the human environment and avoid or minimize any possible adverse effects of their actions upon the quality of the human environment.</p>
21	
	<p>Comment: <i>40 CFR 1502.21 allows you to incorporate material by reference. It also says:</i></p> <p><i>“No material may be incorporated by reference unless it is reasonably available for inspection by potentially interested persons within the time allowed for comment.”</i></p> <p><i>Expecting interested people to drive or fly to Grants New Mexico to inspect the material is not reasonable ... inless you have something to hide.</i></p>

	<p>Response: All materials and literature cited in the Puerco DEA are publically available and would be provided immediately upon request. At least one other commenter actually did request clarification and additional information before the end of the comment period, was provided that information via e-mail, and was able to incorporate that information into comments on the DEA.</p>
2m	
	<p>Comment: <i>You hide important documents related to this project as hardcopies in the project record located in Grants New Mexico. Most of these documents were created on your computer. Even a child has the computer skills to post electronic documents online. If the document was not created on the computer these children would know how to scan them and create a PDF file that could be posted online. Obviously, you do not want the public to read these documents. Why? Either they don't exist or they are truthful and don't support this project.</i></p> <p><i>You and your IDT members will do anything to prevent the public from submitting critical comments as you have your way with the Cibola National Forest owned by 323 million Americans. These Americans want to provide you with informed, meaningful comments based on all the information available about the proposed project ... which you go out of your way to keep them from reading. Practice your talking points, because if your final EA hides information in the project record you will have the opportunity to discuss this issue with one of Senator Udall's and Senator Heinrich's aides. All members of Congress have staff who specialize in helping constituents with difficult/uncooperative federal agencies.</i></p>
	<p>Response: The regulation at 40 CFR 1500.1(b) requires that “environmental information is available to public officials and citizens before decisions are made and before actions are taken. The information must be of high quality. Accurate scientific analysis, expert agency comments, and public scrutiny are essential to implementing NEPA. Most important, NEPA documents must concentrate on the issues that are truly significant to the action in question, rather than amassing needless detail.” The IDT members use a large amount of data and information sources in development of a proposal and analysis of potential impacts.</p> <p>These have been summarized and referenced in the DEA and electronic copies are available in the Project Record. The Puerco Project does not violate 40 CFR 1500.1(b) because information was made available to the public.</p> <p>See, also, the response to comment 2l.</p>
2n	
	<p>Comment: <i>Important information that would help the public understand the proposed project analysis disclosed in your draft EA is hidden away in the project file record. It's sad you use this illegal and unethical scheme to hide information from the public you claim to serve. I have seen it before. Things the Responsible Official claimed were in the Project Record did not exist. The Judge was not amused.</i></p>

	<p><i>There should be no hardcopy documents related to this sale located in the project record on the district. You know they can be easily posted online. Do you really expect a member of the public to drive (or fly) thousands of miles to view this public information? The information belongs to the public. Will you pay for the trip? Will you accept the liability if someone has an accident? Who are you?</i></p>
	<p>Response: See response to comments 2l and 2m.</p>
2o	
	<p>Comment: <i>There is absolutely (emphasis added) no reason to keep information from the public by hiding important documents in the project record. You could scan information and post the PDF files online. All information on file can be made available to the public as attachments. Especially relevant documents should be included in their entirety in an Appendix. Clearly, you do not want the public to see the information in the Project Record. What are you trying to hide from the public?</i></p>
	<p>Response: All documents are available upon request. The scoping letter for the DEA contained names and contact information for those that had questions or needed additional information. The 40 CFR 1500.1(b) and (c) and 40 CFR 1500.2(e) and (f), which you cited previously, enforce this response.</p> <p>1500.1 Purpose.</p> <p>(b) NEPA procedures must insure that environmental information is available to public officials and citizens before decisions are made and before actions are taken. The information must be of high quality. Accurate scientific analysis, expert agency comments, and public scrutiny are essential to implementing NEPA. Most important, NEPA documents must concentrate on the issues that are truly significant to the action in question, rather than amassing needless detail.</p> <p>(c) Ultimately, of course, it is not better documents but better decisions that count. NEPA's purpose is not to generate paperwork - even excellent paperwork - but to foster excellent action. The NEPA process is intended to help public officials make decisions that are based on understanding of environmental consequences, and take actions that protect, restore, and enhance the environment. These regulations provide the direction to achieve this purpose.</p>
2p	
	<p>Comment: <i>As you can see above, 40 CFR 1502.9(b) requires meaningful responses to all “responsible” opposing views. If the Responsible Official feels the opposing view is irresponsible then please describe why. The law does not exclude opposing views because of the source. Opposing views contained in newspapers, magazines, and other sources are still opposing views and require a response. Please do not conclude an opposing view is not responsible because they are opinions. “Viewpoint” and “opinion” are synonyms.</i></p>
	<p>Response: In addition to general comments, Mr. Artley provided 5 attachments alleging over</p>

	<p>100 “responsible” opposing views:</p> <ol style="list-style-type: none"> 1. Opposing Views Attachment 1 – includes 64 citations from various articles and papers related to forest management topics. 2. Opposing Views Attachment 10 – Includes 16 poll results and 6 citations. 3. Opposing Views Attachment 11 – Includes 25 citations 4. Opposing Views Attachment 27 – Includes 24 photographs of clearcuts. 5. Opposing Views Rogue agency – blank document <p>Attachment 1 – This attachment contains 64 citations of allegedly opposing science. Thirty eight of the 64 citations in this attachment were reviewed and 33 of them were found to be old and reflective of agency policy and direction that is no longer applicable to today’s USFS goals, opinion or not peer reviewed, referencing forest types and fire regimes that do not occur in the project area, or referring to clearcutting and/or post fire logging, which are not part of the Puerco Project’s proposed action.</p> <p>Attachment 10 – See Response 2j</p> <p>Attachment 11 – This attachment contains 25 citations of alleged opposing science, many of which are by Dr. Jack Cohen, a research fire physicist who did his research in the Forest Service’s Missoula Fire Sciences Laboratory. Seventeen of the 25 citations were reviewed and only one was applicable and provided background information that was consistent with the project.</p> <p>Attachment 27 – This attachment contains 24 photographs of clearcuts located in national forests in Montana, California, Oregon and Washington. The Puerco project does not propose clearcutting.</p> <p>Opposing Views Rogue agency – This attachment was blank.</p> <p>Detailed responses to these attachments can be found in Table 3 of Appendix E.</p>
2q	
	<p>Comment: <i>Please do not conclude that an opposing view is not “responsible” because they are not site-specific. A review of the References section of this draft EA reveals only 1 Reference document mentions the name of the project. Thus, the vast majority of your references are site specific. Supervisor Hattenbach, you cannot justify using a standard for the public and another less-restrictive standard for the USFS. What will the judge say?</i></p>
	<p>Response: See response to comment 2p.</p>
2r	
	<p>Comment: <i>Ms. Crowley, the Purpose & Need statement at page 4 says the sale will accomplish this:</i></p> <ul style="list-style-type: none"> • <i>Improve wildlife and aquatic species habitat</i> • <i>Improve the condition and function of watersheds</i> • <i>Improve the condition and function of riparian areas, wet meadows, streams, and springs</i>

	<p><i>You either had no IDT influence or you don't know how logging and roading affects aquatic resources.</i></p> <p><i>Please explain how logging 77.1 square miles will improve aquatic species habitat , condition and function of watersheds and function of riparian areas given the clear science written by experts quoted below that say it won't. Please explain why you know more than the scientists quoted below. Please explain why you reject the science conclusions of a Ph.D. expert on aquatic resources and 7 scientists who worked for the USFS Pacific Northwest Research Station quoted below:</i></p> <p><i>"In addition to the direct effects of habitat loss and fragmentation, logging typically reduces ecosystem health by:</i></p> <p><i>a) damaging aquatic habitats through siltation, reduction in stream complexity and increased water temperatures. "</i></p> <p><i>McIntosh, B.A., J.R. Sedell, J.E. Smith, R.C. Wissmar S.E. Clarke, G.H. Reeves, and L.A. Brown "Management history of eastside ecosystems: changes in fish habitat over 50 years, 1935-1992." 1994 USFS Pacific Northwest Research Station, GTR-321 93-181 http://www.fs.fed.us/pnw/publications/pnw_gtr321/</i></p> <p><i>"Logging practices can indirectly result in changes in the biological components of a stream, and can have direct and indirect on the physical environment in streams.</i></p> <p><i>The primary environmental changes of concern are the effects of siltation, logging debris, gravel scouring, destruction of developing embryos and alevins, blockage of streamflow, decrease in surface and intragravel dissolved oxygen, increase in maximum and diel water temperatures, changes in pool/riffle ratios and cover, redistribution of fishes, reduction in fish numbers, and reduction in total biomass. "</i></p> <p><i>Moring, John R. Ph.D. 1975. "The Alsea Watershed Study: Effects of Logging on the Aquatic Resources of Three Headwater Streams of the Alsea River, Oregon – Part III." Fishery Report Number 9 Oregon Department of Fish and Wildlife. http://www.for.gov.bc.ca/hfd/library/ffip/Moring_JR1975b.pdf</i></p>
	<p>Response: Mitigations described in the Puerco BMPs (Appendix D) described the practices that will be used to prevent or mitigate these effects. Intact buffers around streams have been shown to reduce effects to the benefits you mention. In addition, there are mitigations prescribed to reduce the number of stream crossings and locate landings, decks, slash piles</p>

	<p>away from water resource features. In the study you reference by Moring (1975), the use of buffer strips is recognized as essential for the prevention of direct physical changes and indirect biological changes in the stream environment. These buffer strips are shown to be important for all the factors you mention above. Buffers are prescribed for water resource features in the Puerco project. In addition, the other recommendations outline by Moring (1975) are also incorporated into the Puerco project. The Eastside study (McIntosh et al) describes impacts related to activities from 1935-1992. Many of the practices which led to the observed declines in fish populations are no longer used today and not proposed for use in the Puerco project. This study mentions that livestock use, especially past sheep utilization appeared to be the primary impacts to fish populations. Forestry is a smaller impact to these systems as described in this study. This study is not specific to the types of forestry proposed by the Puerco project, including the mitigations used to prevent and mitigate impacts related to those activities. By prescribing and implementing mitigations that have been shown to be effective in mitigating impacts to water resource features and their dependent values, the Puerco project will not have the impacts you describe. This is supported by the research you cite as well as additional research cited in the watershed report.</p>
2s	<p>Comment: <i>Ms. Crowley, the Purpose & Need statement at page 4 says the sale will 1) Improve wildlife and aquatic species habitat, 2) Improve the condition and function of watersheds and 3) Improve the condition and function of riparian areas, wet meadows, streams, and springs. You must think you know more than Mr. Wuerthner who says this:</i></p> <p><i>“Logging equipment compacts soils. Logging removes biomass critical to future soil productivity of the forest. Logging disturbs sensitive wildlife. Logging typically requires roads and skid trails which create chronic sources of sedimentation that degrades water quality and aquatic organism habitat. Logging roads and skid trails are also a major vector for the spread of weeds. Logging disrupts nutrient cycling and flows. Logging can alter species composition and age structure (i.e. loss of old growth). Logging can alter fire regimes. Logging can change water cycling and water balance in a drainage. The litany of negative impacts is much longer, but suffice it to say that anyone who suggests that logging is a benefit or benign is not doing a full accounting of costs.”</i></p> <p><i>Those who suggest that logging “benefits” the forest ecosystem are using very narrow definitions of “benefit.” Much as some might claim that smoking helps people to lose weight and is a “benefit” of smoking.”</i></p> <p><i>Wuerthner, George “Who Will Speak For the Forests?”</i> <i>NewWest, January 27, 2009</i> <i>http://www.newwest.net/topic/article/who_will_speak_for_the_forests/C564/L564/</i></p>
	<p>Response: The Puerco project proposes activities in addition to logging. While logging</p>

	<p>activities do have negative impacts to watershed resources, these are largely mitigated by BMPs as described in the appendix. For soils, these BMPs including leaving woody material and reducing the risk of large scale high intensity wildfires for an overall improvement on 66,945 acres of the project area as described in the watershed report. Areas where localized impacts occur will be treated as needed to restore soil productivity. For water resources, nineteen springs will be improved with site specific restorative activities to protect the associated ecosystem and dependent values such as wildlife and recreation. Springs will not be impacted by the direct effects of vegetation management activities because there is an effective buffer prescribed for these features as described in the BMPs (Appendix D). Riparian areas are proposed for fencing in the Puerco area and are also excluded from the vegetation management activities proposed for the upland areas in the Puerco project by a prescribed buffer. Streams have buffer widths of varying widths, depending on the stream type. References in the watershed report and in the Moring (1975) reference you cite, buffers are recognized as an effective way to reduce effects from logging activities. Road decommission is also proposed resulting in improved condition along 68 miles of stream channels. Overall, the effect is an improvement to water resources and soils.</p>
2t	
	<p>Comment: <i>Ms. Crowley, the Purpose & Need statement at page 4 says the sale will 1) Improve wildlife and aquatic species habitat, 2) Improve the condition and function of watersheds and 3) Improve the condition and function of riparian areas, wet meadows, streams, and springs. You must think you know more than scientists from the PNW research station who say this:</i></p> <p><i>"In addition to the direct effects of habitat loss and fragmentation, logging typically reduces ecosystem health by:</i></p> <p><i>a) damaging aquatic habitats through siltation, reduction in stream complexity and increased water temperatures."</i></p> <p><i>McIntosh, B.A., J.R. Sedell, J.E. Smith, R.C. Wissmar S.E. Clarke, G.H. Reeves, and L.A. Brown "Management history of eastside ecosystems: changes in fish habitat over 50 years, 1935-1992." 1994 USFS Pacific Northwest Research Station, GTR-321 93-181 http://www.fs.fed.us/pnw/publications/pnw_gtr321/</i></p> <p><i>Who are you? Even a child knows logging harms aquatic resources.</i></p>
	<p>Response: Please see the replies for comments 2r and 2s.</p>
2u	
	<p>Comment: <i>USFS land managers know what to do right after an unauthorized, user-created road is discovered. They must be removed from the landscape completely (obliterate) and</i></p>

	<i>pile rocks and logs after they have been hydrologically stabilized so they won't appear (be rebuilt) again. How many years have the unauthorized roads existed? How many tons of sediment enter the streams each year because of your incompetence?</i>
	Response: These unauthorized roads were mapped during project planning in 2014, and some were identified as closed in the Mount Taylor Travel Management Decision in 2011. The safety of our road users is a high priority but the current level of funding and staffing cannot keep up with maintenance of roads authorized under Travel Management, much less decommission/rehabilitate hundreds of miles of unauthorized roads. Where these roads occur within a project area, such as Puerco, the analysis will include work identified in the Travel Management Decision. For Puerco, contractors will rehabilitate identified, high priority unauthorized roads as part of their work when performing forest restoration.
2v	
	<p>Comment: <i>On October 30, 2006 USFS Chief Bosworth announced the Four Threats to the Health of the Nation's Forests and Grasslands. Number 4 was "Unmanaged Recreation." Here's an excerpt:</i></p> <p><i>"Only a small number of OHV users who use their vehicles going cross-country leave lasting traces on the land. However, even this small percentage has created undesired impacts."</i></p> <p><i>You can read more at:</i> https://www.fs.fed.us/projects/four-threats/key-messages/unmanaged-recreation.shtml</p> <p><i>Request for changes to be made to the final NEPA document: Tell the public all unauthorized roads will be obliterated and rendered hydrologically stable.</i></p> <p><i>Failure to do so will violate 40 CFR 1500.2(f) because the Responsible Official did not "use all practicable means" "to restore and enhance the quality of the human environment and avoid or minimize any possible adverse effects of their actions upon the quality of the human environment."</i></p>
	Response: The proposed action includes rehabilitation of up to 200 miles of unauthorized roads. Where unauthorized roads are utilized for restoration purposes, the roads will be rehabilitated/decommissioned as part of the close-out operations. Roads outside of forest restoration areas would be prioritized for rehabilitation/decommissioning and funds sought to complete the work. The Puerco decision will cover the rehabilitation/decommissioning work.
2w	
	Comment: <i>The Puerco timber sale will take away more undeveloped national forest acres from the legacy the unborn kids of the future should inherit. Which is most important: the future kids of America seeking solitude and quietness, or another summer home and yacht for the CEO of the timber extraction corporation that purchases this timber sale? Do the</i>

	<i>IDT members have the courage to ask themselves why the USFS defies the wishes of the American public by logging and roading-up the precious national forest land? How can an agency mandated to serve the public do so by taking action the public does not want or like?</i>
	<p>Response: The Puerco Project is not a timber sale. The acres to be restored are included in the Zuni Mountain CFLR Stewardship Project Agreement with National Wild Turkey Federation. The project will adjust vegetation densities in forests, woodlands, shrub and grasslands to historic levels that existed before the natural frequent low-intensity fire regime was interrupted. Fire will be reintroduced back onto the landscape to perform its natural function(s). The Puerco project will utilize silvicultural systems that create, move toward or maintain uneven-aged conditions, targeting mid-aged trees that are in excess across the landscape. Mid-aged trees are of low value and do not pay for themselves out of the woods, thus the need for the stewardship agreement, which allows for the exchange of goods (timber) for services (thinning, slash treatment, road maintenance, other resource restoration work). This project does not propose to build any new or temporary roads.</p> <p>This project was developed transparently, with full public participation. Per FSH 1909.12, Chapter 40, during the land management planning public participation is required. Building on the experience of implementing the Bluewater CFLRP, the Puerco Collaborative Forest Landscape Restoration Project continued to:</p> <ul style="list-style-type: none"> • Directly engaged the public to exchange information with each other and work together on one or more issues during the planning process, and identified where there was agreement and disagreement. • Worked closely with interested members of the public to clarify concerns and seek feedback on how to meet challenges presented by the planning process. • Provided information to the public and seek suggestions as well as feedback on potential issues and concerns. • Provided sufficient objective information to the public to convey an understanding of intended actions, processes, and preliminary issues. <p>Public Participation and collaboration is documented in the Public Involvement Section of Chapter One.</p>
2x	
	<p>Comment: <i>My Pending Objection</i></p> <p><i>The public is now starting to realize the USFS Objection process is a joke. Sadly, most USFS employees believe the agency can do no wrong. The English language has a word to describe this “Pollyanna.” Webster defines it as “a person characterized by irrepressible optimism and a tendency to find good in everything.”</i></p> <p><i>Intelligent, unbiased, un-brainwashed people understand that the Objection Deciding Officer (ODO) must be an unbiased 3rd party with no interest in whether a project is implemented or not. The USFS rigged the Appeal process against concerned members of the public and the same is happening with the Objection process. They assure the ODO is a</i></p>

	<p><i>USFS employee who will claim anything to avoid the appearance that another USFS employee has made an error.</i></p> <p><i>I know that you know my objection will be rejected by the Objection Deciding Officer before he/she reads my objection.</i></p> <p><i>I know that you know the agency treats objections fairly and professionally only if they are filed by groups or individuals who have a history of taking the USFS to court. My motivation for writing these comments is to identify how unprofessional, naive and clueless you all are. For those of you who know what's going on and still press on because your job pays well, I hope the guilt sneaks upon you later in life. Generations of the future will want to know who was responsible for the development and plunder of their public land. Wanna see plunder? Take another look at photos of USFS "restoration" projects by opening the Opposing Views Science Attachment #27.</i></p>
	<p>Response: Thank you for your opinion and your participation in this project. All of the "restoration" photos you provide in attachment #27 show clearcut treatments, which are not proposed in the Puerco Project.</p>
3 – R. Siegmann	
	<p>Summary: "I agree this project is needed, please view the following comments:"</p>
3a	
	<p>Comment: "Page – 19: Decommissioning of 200 miles of roads.... These should be addressed with public comment taking into consideration a newly built road may be safer and more purpose-full than an older one. Perhaps the older one should be decommissioned."</p>
	<p>Response: A map of roads proposed for rehabilitation/decommissioning were included in the public scoping of the Proposed Action in March 2017 and again in the scoping of the Draft EA in July 2018. Roads identified for rehabilitation/decommissioning are not designated as National Forest system roads and were not designated as open to vehicle use in the Travel Management on the Mt Taylor Ranger District Decision (2011). The decision on which roads to manage as open to vehicle use was made with the 2011 Travel Management Decision.</p>
3b	
	<p>Comment: "Page – 4: "Decommissioning roads again should be with public comment."</p>
	<p>Response: See response to Comment 3a.</p>
3c	
	<p>Comment: "Page – 20: Thinning within ¼ mile of main roads. I may not have understood this fully. People should be allowed to drive on roads commissioned for logging purposes and the roads not closed immediately after logging, but a time after the public has had a chance to utilize them for slash or other after-logging salvage events are completed, as not to put a hardship on this effort."</p>
	<p>Response: The decision on which roads to manage as open to vehicle use was made with the 2011 Travel Management Decision. However, unauthorized roads used for project implementation may be left open temporarily, for public use or not, to facilitate removal of fuelwood (via permit) or prescribed burning.</p>

4 – Sue Small, Native Plant Society of New Mexico	
	Comment: “Page 6 – Suggestion to provide a baseline of current effects of current water developments with a study format to assess the impact of any beneficial or non-beneficial changes occurring after improvements of water developments with a plan to publically distribute the assessment results after a one – two-year study period.”
	<p>Response: Baseline surveys for current water developments do not exist. Existing earthen tanks or wells are normally cleaned out or repaired as existing maintenance. In general, water developments of all types are beneficial for livestock, wildlife and associated resources. They dissipate animal concentrations from creeks, stream bottoms, etc., across the project area and distribute animals to underutilized forage. Water can be used as a tool to manage livestock, such as turning off water at well sites, closing water-lot gates to springs or earthen tanks to reduce localized impacts.</p> <p>There is no plan to complete a baseline of current effects of current water developments with a study format to assess the impact of any beneficial or non-beneficial changes occurring after improvements of water developments with a plan to publically distribute the assessment results after a one – two-year study period. There is information on the location and use of water developments in the Puerco project area as described in the EA. Additional information on springs and other water resource features can be found in the watershed report. More in depth information about springs and streams is being collected through agreements with the University of New Mexico (UNM) and the Spring Stewardship Institute (SSI). There will be monitoring of restoration projects including water development improvements through the Best Management Practices (BMP) monitoring process and other resource monitoring work.</p>
4a	
	Comment: Page 22 - Suggestion to add italicized text: Riparian areas are in proper functioning condition and support higher ecological values “ <i>including native plant species maintenance and regeneration, in stream flow, bank stabilization, visual and cultural resource properties</i> ”
	Response: Thank you for your suggestion, the text has been added to the Final EA.
4b	
	Comment: Page 29 - Suggestion to add italicized text: Spring restoration would include reducing tree encroachment and noxious weeds... “, <i>as well as reestablishing or protecting native plant species which currently exist or have been documented to exist in the area.</i> ” Documentation of such species can be from established, published, or peer reviewed anecdotal sources.
	Response: Thank you for your suggestion, the text has been added to the Final EA.
4c	
	Comment: Page 33 - Suggestion to add italicized text: Restore approximately 19 springs “ <i>and reestablish or protect native plant species which currently exist or have been documented to exist in the area.</i> ” Documentation of such species can be from established,

	<i>published, or peer reviewed anecdotal sources.</i>
	Response: Thank you for your suggestion, the text has been added to the Final EA.
4d	
	Comment: Page 33 - Suggestion to add italicized text: Construct protective barriers around springs, aspen, and willows as needed for protection of “ <i>native plant species, stream bank integrity, and scenic value,</i> ” of approximately 300 acres.
	Response: Thank you for your suggestion, the text has been added to the Final EA.
4e	
	Comment: Page 33 - Suggestion to add italicized text: Re-drill 3 existing wells and establish 3 new wells “ <i>and collect and provide data which is publically accessible on the withdrawal rates and impacts on groundwater resources and affected springs.</i> ” Install or extend 2 pipelines “ <i>and provide data which is publically accessible on the pipeline lengths, routes, and water delivery rates.</i> ”
	Response: Metering of groundwater wells is not required by the Office of the State Engineer (OSE) in this area, there is a limit of 3 acre feet in the permit from OSE.
4f	
	Comment: Page 76 - Two grasses are focused upon: Mountain Muhly and Arizona Fescue. Overlooked species which studied would then provide sound environmental and socioeconomic information, and should include: (22 species listed)
	Response: Mountain Muhly and Arizona fescue were referred to based upon studies that documented their responses to fire or mechanical thinning (Gaines et al. 1958 and Sackett et al. 1996) as part of the effects analysis in the vegetation section. These are also 2 of the main indicator species for ponderosa pine habitat types, which is why they were focused on. There is no doubt that the other species listed by the commenter would also benefit from restoring historic tree densities and reintroducing fire.
4g	
	Comment: Page 146 - Please explain if there is a wildlife fauna nesting in this report section which covers the Zuni flea bane
	Response: This was a typographical error and it should have read just “suitable habitat”, the word nesting is in the wrong place. It will be corrected in the final EA, thank you for bringing it to our attention.
4h	
	Comment: Page 193 (Brannon Allotment) Grasslands on the allotment were found to be in good to excellent condition “ <i>based upon the following criteria: Please describe the criteria used to determine this rating.</i> ” “ <i>As this inspection was performed 15 years ago, when will it be repeated?</i> ”
	Response: Data collected by Range Staff in 2001 summarized ground cover, plant species, and pounds of usable forage expressed in pounds per acre. Specific data collection protocol was not identified in the 2001. The intent was to collect additional data on production, ground cover, and frequency within key areas of the Brannon Allotment to support a decision. Currently the allotment is used conservatively with stocking to 40 mixed/class

	<p>cattle for a period of 6 months. Other actions that will could trigger additional rangeland surveys include but are not limited to: changes in livestock management, new wildlife or plant species listings or significant large wildfires.</p> <p>Utilization monitoring of the allotment shows overall conservative forage use levels within key areas. Generally conservative use is any forage use no greater than 40% of the usable forage of a plant.</p>
4i	
	<p>Comment: Page 194 (Stinking Springs Allotment) <i>“If the stream is in bad condition, please describe the criteria which were used to determine this stream’s condition.”</i></p> <p><i>“What is the condition of the Little Bear Spring and are there plans to improve this condition of this spring? If so, what are the plans?”</i></p> <p>Response: The “bad condition” referred to the condition of the old fence around the spring, which is currently in disrepair. The water flow from Little Bear Spring has decreased, likely due to the drought conditions and lack of snow pack. Currently, no plan is in place to improve the spring.</p>
4j	
	<p>Comment: Page 196 (Dan Off Allotment) <i>“If this allotment is closed, what are the plans to ensure it is not being used for grazing of domestic animals?”</i></p> <p><i>“What measures were used in the 2012 productive utilization survey which was conducted in Section 35 that revealed forage utilization by ungulates ranged from 0% to 20.6%?”</i></p> <p><i>“Were the ungulates classified according to species? Are there forest service guidelines to determine what ungulate species is grazing in an area?”</i></p> <p>Response: The former Dan Off Allotment comprises of 5,176 acres of National Forest that is mixed in with Navajo Nation Reservation lands. There are no current plans to fence off portions of Forest lands due to the sheer volume of fences that would be needed to be constructed, and is generally considered not to be cost-effective.</p> <p>In 2012 the Harvest Method was used for Production (clip and weigh) along with grazing utilization monitoring using Height-Weight method which determined use levels from 0% to 20.6%.</p> <p>Utilization surveys do not distinguish which ungulates used the forage. Utilization surveys can be designed to distinguish between livestock and wildlife use, however this normally involves the construction of exclosures to exclude livestock use from wildlife use. In addition, wildlife pellet counts can be completed concurrently to determine wildlife presence in the area but do not distinguish levels of forage use by species. There are no “Forest</p>

	Service guidelines” to determine what ungulate species are grazing in an area other than domestic livestock. Other wildlife ungulate species may be in an area, but generally, wildlife use is determined by habitat suitability for any particular ungulate species.
4k	
	<p>Comment: Page 198 - The actual assessment on the ground will depend on the types of treatment done and will define an alternative management needed to foster the recovery of understory species such as grasses, forbs, shrubs, and brow[s]ed species....</p> <p><i>Please provide a list of the species which will be assessed.</i></p> <p><i>What is the assessment method?</i></p> <p><i>What are the assessment criteria?</i></p>
	<p>Response: The assessment of livestock use as noted will be determined by the type and scope of any particular treatment. As noted, determinations of livestock numbers, season of use or deferment will be made to meet the goals of fostering the recovery of the grass, forbs, and shrub species.</p> <p>Implementation monitoring will be used to assess livestock use levels in areas where treatments are occurring, to determine utilization levels on key species. Ocular assessment is normally used to initially determine use levels, however other methods that may be used but not limited to: stubble height, height/weight, or landscape appearance. The specific monitoring protocol will be determined at that time. Generally species that are assessed are identified in the particular Terrestrial Ecosystem Unit where the treatment is occurring. Effectiveness monitoring assessment methods may vary, however assessment will focus on components of ground cover, herbaceous production, and frequency and/or composition of species. A complete list of assessment methodologies for both implementation and effectiveness monitoring can be found in the <i>Interagency Technical Reference – Utilization Studies and Residual Measurement and Sampling Vegetation Attributes. 1996.</i></p>
4l	
	<p>Comment: Page 199 (Prewitt/6A Allotment)</p> <p><i>What were the specific determinants that indicated a need to drill the wells indicated in this section and to conduct the additional water developments?</i></p>
	<p>Response: During project development and scoping, specific projects were initially identified by livestock permittees along with agency representatives. These projects are intended to facilitate the intent outlined in the <i>Purpose and Need Section</i> on page 4 of the document. Location and or timing of implementation of identified projects, will be determined based on meeting site specific ecological objectives identified for any specific treatment area.</p>
4m	
	<p>Comment: Page 199 (Wingate Allotment)</p> <p><i>“If there is not a location for the new well as indicated in the second bullet, what were the criteria for determining a new well was needed?”</i></p>

	Response: See 4l response.
4n	
	<p>Comment: Page 201 (Stinking Springs Allotment) <i>What is the water source for the pipeline extension planned to reach a corral? This is indicated by the sixth bullet in the list.</i></p> <p>Response: From an existing well in Section 13 of the allotment. The extension would be from an existing pipeline.</p>
4o	
	<p>Comment: Page 202 (Dan Off Allotment) <i>What plans are there to now maintain the boundary fence in this allotment? If not plans, why are there no plans?</i></p> <p>Response: See response to 4j.</p>
5 - NM Wildlife Federation	
	<p>Summary comments: <i>“While wildfire prevention measures such as mechanical thinning and prescribed burns can be disruptive to the ecosystem, NMWF recognizes the importance of these efforts to the long-term health of the forest and its resiliency.”</i></p> <p><i>“The extent to which the current vegetation conditions of the project are leave it prone to uncharacteristic disturbances is too substantial a risk to be left alone, especially given the increased threat of wildfires in recent years. Therefore, we believe that the benefits of carefully planned and executed forest thinning outweigh the potential damage from uncharacteristic disturbances such as active crown fire behavior.”</i></p> <p><i>“We applaud the emphasis the Mount Taylor Ranger District has placed on enhancing wildlife habitat and ensuring wildfire prevention activities do not cause any long-term damage to sensitive wildlife populations within the project area. As noted in the environmental assessment, the impact of uncharacteristic wildfire behavior can be much more detrimental to wildlife than the temporary impact of thinning activities and prescribed burns. It’s essential that we undertake these restoration efforts to improve wildlife habitat within the project area and the health of the forest overall.”</i></p> <p><i>“We also support the decommissioning of up to 200 miles unauthorized roads within the project area. This restoration will be crucial to resolving fragmentation of wildlife habitat throughout the project area.”</i></p> <p><i>“Again, we thank you for the opportunity to provide comment on the Puerco CFLR Project and share our support for the proposed forest restoration action (preferred alternative B). We look forward to continuing this collaboration with your agency in the future.”</i></p>
	<p>Response: We thank you for your comments and will continue our efforts to involve the public, our partners and collaborators as we finalize this analysis and move into project implementation.</p>

5a	<p>Comment: “Though we recognize the wildfire prevention efforts will benefit nearly all aspects of forest resiliency, we wanted to note that the current state of soils within the project area is of significant concern. As documented in the environmental assessment, in a majority of the Terrestrial Ecological Units within the project area, soils are either designated as “impaired” or “unsatisfactory”. While further impacts will be mitigated through design features and Best Management Practices, we certainly hope that beyond this restoration project, the Mount Taylor Ranger District will undertake additional soil restoration projects which will only support the forest resiliency work being accomplished through the CFLRP.”</p> <p>Response: In addition to mitigation, several of the project activities should work to improve soil condition by increasing vegetative ground cover where conditions are favorable in thinning areas, also woody material will be left on the ground to add this component to the soil where it is lacking – which is much of the project area.</p>
5b	<p>Comment: “Upon review of the measures used to assess effects on water resources by alternative, we support the proposals outlined in alternative B in part because the total positive effect measure was greater than the total negative measure for these proposed actions. That said, the difference in positive and negative effects wasn’t very large, so we expect to see close monitoring of riparian areas and ephemeral streams within the vegetative treatment area throughout the restoration process and as much mitigation as can be accomplished through the Best Management Practices provided.”</p> <p>“We expect that there will be strict enforcement of policies to prevent unnecessary damage to watersheds, such as the buffer designated management zones. This is especially true within the Upper Rio Nutria HUC 6 and the Rio Nutria HUC 5 watersheds which occupy Zuni Bluehead sucker critical habitat.”</p> <p>Response: Best Management Practices (BMP) monitoring occurs throughout the forest on randomly selected projects. The Puerco project, as a large landscape project, will have a portion of this monitoring occur within its boundaries. Implementation of buffer zones has been improving in recent years with pre-implementation mapping and coordination of foresters with the hydrologist.</p>
5c	<p>Comment: “Much of the proposed thinning within the project area is scheduled to occur most likely between early fall and spring. Given that this coincides with hunting season and could lead to campground closures and limited road access, we request that the Mt. Taylor Ranger District ensure the public receives adequate notice of any closures within the project area.”</p> <p>“Given the outcry from some outdoor recreationists surrounding the decommissioning of unauthorized roads, we strongly encourage the district to continue collaborating with these groups one-on-one and through the Cibola Shared Stewardship Collaborative to develop</p>

	<p><i>recreation plans that would curb the establishment of unauthorized roads.”</i></p> <p>Response: Thank you for your comment, we will continue to collaborate with all our partners on all resource protection issues.</p>
6 – New Mexico Game & Fish Department	
	<p>Comment: <i>“The DEA states (p. 17-18) that for the ponderosa pine (Pinus ponderosa)- Gambel oak (Quercus gambelii) and dry mixed conifer forest types, a maximum 18-inch diameter at breast height (DBH) cap will apply, and no trees over that size will be removed, per the Mexican Spotted Owl Recovery Plan (2012).”</i></p> <p><i>“The Department supports restoration treatments that protect older and larger trees. For the Puerco CFLRP project, the Department encourages protection from cutting of all large trees within treated areas that meet or exceed these size caps (including the old tree retention strategy), regardless of age, to provide upper canopy nesting structure for migratory birds, including within areas proposed for mistletoe treatment.”</i></p>
	<p>Response: The Draft EA states for Ponderosa Pine - Gambel Oak (page 17) – “Retain all trees 18” DBH and greater, per Mexican Spotted Owl recovery Plan (2012).”</p> <p>The Draft EA states for Dry Mixed Conifer (Frequent Fire) (page 18) “Managing for old age trees such that as much old forest structure as possible is sustained over time across the landscape. Retain all trees 18” DBH and greater that have no sign of insect or disease damage.” Per the 2012 MSO recovery Plan:</p> <p><u>Guidelines for Forested Recovery Habitat Managed as Nest/Roost Habitat (pages 267-268):</u></p> <ul style="list-style-type: none"> ➤ Because it takes many years for trees to reach large size, we recommend that trees ≥46- cm (18 inches) DBH not be removed in stands designated as recovery nest/roost habitat unless there are compelling safety reasons to do so or if it can be demonstrated that removal of those trees will not be detrimental to owl habitat. <p><u>Guidelines for Forested Recovery Foraging/Non-breeding (formerly Restricted) Habitat (pages 268-269):</u></p> <ul style="list-style-type: none"> ➤ Strive to retain (do not cut) all trees >61 cm (> 24 in) DBH, the average diameter of nest trees, unless overriding management situations require their removal to protect human safety and/or property (e.g., the removal of hazard trees along roads, in campgrounds, and along power lines), or in situations where leaving large trees precludes reducing threats to owl habitat (e.g., creating a fuel break). To the extent practical, fuel breaks should be designed to avoid the removal of larger trees (trees over 18 in [46 cm] DBH). ➤ Design and implement management treatments within Forested Recovery Foraging/Non-breeding habitat so that trees (>46 cm [18 in] DBH) are retained, unless this conflicts with forest restoration and/or owl habitat enhancement goals. ➤ Previous wording of this guideline (USDI FWS 1995) was interpreted to mean that trees >46 cm (18-in) DBH may not be removed. That is not our intent. However, large trees are a key habitat correlate for owls, and removal of such trees should be done judiciously and only when truly necessary to meet specific resource objectives.

	The Puerco Project will retain all trees 24” DBH and larger, regardless of condition, as well as all trees exhibiting old tree characteristics as outlined in the Zuni Mountain CFLR Old Tree Retention Guidelines. In addition, because larger trees (18”+ DBH) are a key habitat correlate and are deficit across the landscape, removal of such trees will be done judiciously and only when truly necessary to meet specific resource objectives, but a strict 18” diameter limit is not proposed.
6a	<p>Comment: “For treatments within pinyon-juniper woodland habitats, the Department recommends preferentially leaving pinyon trees over one-seed juniper (<i>Juniperus monosperma</i>) trees. Large mortality events of pinyon pine trees have occurred across northern New Mexico due to drought and subsequent phytophagous beetle attacks, and they provide important seed crops and nesting habitat for declining, pinyon-obligate bird species such as pinyon jay (<i>Gymnorhinus cyanocephalus</i>), a New Mexico Species of Greatest Conservation Need.”</p> <p>Response: Desired condition acres for each vegetation cover type are determined from Terrestrial Ecosystem Unit Inventory (TEUI) data collected from the Cibola National Forest (DEA page 13). Treatments described in the Proposed Action Alternative would move vegetation toward more desired composition and distribution as described in the Cibola ALRMP and TEUI Inventory (DEA page 14). Because pinyon pines tend to be the largest and healthiest species that occupy PJ Woodland sites and one-seed juniper is more apt to be small diameter, shrubby and serve as a fuel ladder, pinyon pine is often favored where hazardous fuel reduction is the objective.</p>
6b	<p>Comment: “As discussed with Forest staff, the Department supports increasing the post-treatment basal area of leave trees within the treated areas of the Puerco project to 55-60 square feet per acre. This represents an approximate 10% increase above the Bluewater prescription, and will mitigate for tree mortality from post-thinning prescribed burning activities.</p> <p>Response: Ponderosa pine tree density within treated areas would generally range from 22 to 89 ft² of basal area per acre (DEA page 36-37), and Ponderosa-Gambel Oak would be treated similar to ponderosa pine, but additional emphasis placed on retaining and promoting the growth of additional large hardwoods >5” diameter at root collar (drc) and other wildlife habitat attributes. Through monitoring and the adaptive management process used during implementation of the Bluewater Project, it has been determined that thinning most ponderosa pine stands to a target basal area of approximately 55-60 ft² per acre provides assurance that any subsequent mortality within treated stands will keep them stocked well-within the desired density range.</p>
6c	<p>Comment: “The Department strongly supports components of the Puerco CFLRP that will restore springs, streams and riparian areas. This includes constructing protective barriers around springs and riparian areas to allow for vegetation recovery, and maintaining dispersed livestock grazing across the landscape to prevent excessive impacts to mesic riparian areas.”</p>

	Response: Thank you for your support of this component of the Proposed Action.
6d	<p>Comment: <i>“The Department appreciates the commitment by the Forest and within the DEA to protect Gambel oak within the Puerco project area. In the Southwestern U.S., Gambel oak is an important component of productive wildlife habitat, providing browse and acorn mast crops for deer, turkey, and many other game and non-game mammals and birds, and also provides cover and nesting structure for wildlife (Reynolds et al. 1970). In New Mexico and Arizona, ponderosa pine forests with Gambel oak have been documented to support higher bird diversity and abundance than ponderosa pine forests without Gambel oak (Jentsch et al. 2008). Therefore, the Department provides the following recommendations regarding Gambel oak treatments.</i></p> <ul style="list-style-type: none"> • <i>Retain a mosaic of all sizes and age classes of Gambel oak across treated areas.</i> • <i>Retain tree-form Gambel oak in the 12-24” diameter range to maximize acorn production for game and non-game species (Clary and Tiedemann 1992) and larger diameter Gambel oak to provide nesting and roosting habitat for turkey and other bird species.</i> • <i>Retain patches of pole-sized Gambel oak in the 3-6 inch diameter at breast height range for nongame bird Species of Greatest Conservation Need. Increased bird diversity has been documented in ponderosa pine forests with Gambel oak stands of this size class (Jentsch et al. 2008)</i> <p>Response: The Puerco Project will follow guidance provided in the Mexican Spotted Owl Recovery Plan (2012), such as:</p> <ul style="list-style-type: none"> ➤ Within pine-oak and other forest types where hardwoods are a component of owl habitat, emphasis should be placed on management that retains, and promotes the growth of additional, large hardwoods (pages 268-269). ➤ Pine-oak forest type: ≥10% of the stand BA or 4.6 m²/ha (20 ft²/ac) of BA consist of Gambel oak ≥ 13 cm (5 in) drc (page 278).
7 – Center for Biological Diversity	
	<p>Summary: <i>“Overall, the Center regards the project as a potentially highly beneficial management activity insofar as vegetation treatments at strategic locations can facilitate landscape-scale restoration of fire-adapted ecosystems including ponderosa pine forest, mixed conifer, and woodland communities.”</i></p> <p><i>“Wildland fire use is essential to forest restoration and should be a key ingredient of the purpose and need to protect human communities and infrastructure from undesirable effects of wildland fire over the long-term. Based off of the field trip that I attended in July, 2018, I am confident that the Cibola Fire Management staff is capable of using beneficial fire to restore ecosystems at a fraction of the cost of repeated mechanical entries – even under severe fire weather conditions.”</i></p> <p><i>“As stewards of our public lands, we expect the Cibola National Forest to utilize the best available science, public participation, and ecological management principles to move the vegetative communities of the Puerco project towards a state of higher ecological integrity</i></p>

	<p><i>and resilience – and not into a regulated production forestry model that is reliant on periodic commercial entries to achieve desired conditions. The direction provided in the Draft EA suggests that there has been significant attention given to this. We provide some additional new information in this comment that will expand on this scientific basis.”</i></p> <p><i>“We appreciate the comprehensive restoration approaches presented for the Puerco project. Many landscape restoration projects in the southwest do not include the riparian, watershed, and road closure elements that the Puerco project includes. Certainly, these are requirements of the CFLR program, however they are much needed. We applaud the Cibola NF for including these treatments in addition to thinning and fire treatments only. The Center largely supports this project as it is well designed, the Draft EA provides a thorough and comprehensive review of cumulative effects, and the range of restoration modalities supports the notion that it is indeed a “landscape” restoration project.”</i></p> <p><i>“We encourage the Cibola NF to implement the 200 miles of road closures and soil restoration as soon as possible, and are exceptionally pleased that no new temporary roads would be constructed as part of this project. In addition, we appreciate the attention given to project design features that blend logging treatments with scenic and recreation resources. The enjoyment of our public lands is a principal way for the American people to connect with and thus speak on behalf of the natural environment. Attention to scenery and trails is appreciated by the public who largely doesn’t understand many forest management activities.”</i></p> <p><i>Response: Thank you for your interest in the development of this project.</i></p>
7a	<p><i>Comment: “QUESTION: The amount of this vegetation type that this applies to is unclear. Does the 18” limit apply to all 15,033 acres of PIPO-QUGA, or just the 20% of the vegetation type that is managed for old growth conditions per the forest plan?”</i></p> <p><i>“RECOMMENDATION: Because of the isolated, island type nature of the Zuni Mountains, and their discontinuity with other MSO habitats, we recommend that the entire 15,003 acres of PIPO-QUGA utilize an 18” diameter limit.”</i></p> <p><i>Response: The Draft EA states for Ponderosa Pine - Gambel Oak (page 17) – “Retain all trees 18” DBH and greater, per Mexican Spotted Owl recovery Plan (2012).”</i></p> <p><i>Per the 2012 MSO recovery Plan:</i></p> <p><u><i>Guidelines for Forested Recovery Habitat Managed as Nest/Roost Habitat (pages 267-268):</i></u></p> <ul style="list-style-type: none"> ➤ <i>Because it takes many years for trees to reach large size, we recommend that trees ≥46- cm (18 inches) DBH not be removed in stands designated as recovery nest/roost habitat unless there are compelling safety reasons to do so or if it can be demonstrated that removal of those trees will not be detrimental to owl habitat.</i> <p><u><i>Guidelines for Forested Recovery Foraging/Non-breeding (formerly Restricted) Habitat (pages 268-269):</i></u></p>

	<ul style="list-style-type: none"> ➤ Strive to retain (do not cut) all trees >61 cm (> 24 in) DBH, the average diameter of nest trees, unless overriding management situations require their removal to protect human safety and/or property (e.g., the removal of hazard trees along roads, in campgrounds, and along power lines), or in situations where leaving large trees precludes reducing threats to owl habitat (e.g., creating a fuel break). To the extent practical, fuel breaks should be designed to avoid the removal of larger trees (trees over 18 in [46 cm] DBH). ➤ Design and implement management treatments within Forested Recovery Foraging/Non-breeding habitat so that trees (>46 cm [18 in] DBH) are retained, unless this conflicts with forest restoration and/or owl habitat enhancement goals. ➤ Previous wording of this guideline (USDI FWS 1995) was interpreted to mean that trees >46 cm (18-in) DBH may not be removed. That is not our intent. However, large trees are a key habitat correlate for owls, and removal of such trees should be done judiciously and only when truly necessary to meet specific resource objectives. <p>Limiting the size of trees to be cut to a single diameter limit would hamper the ability to achieve the purpose and need for this project. Studies (Abella et al. 2006; Triepke et al 2011; Sanchez-Meador et al.) have shown that conserving trees greater than 16 inches in diameter creates the inability to develop or maintain uneven-aged forest structure. Retention of all trees greater than 16 inches in diameter obstructs establishment of ponderosa pine regeneration, which perpetuates the even-aged forest structure. The desired conditions required to meet the stated purpose and need of this project are uneven-aged forest structures. The inability of a single metric to evaluate “success” is further decreased by the application of social and political values such as diameter caps, which limit options for managers (Sanchez-Meador et al 2015). A blanket policy of diameter-limit cutting impairs the ability of resource managers to achieve or maintain desired conditions, and is not sustainable in the mid to long term (Triepke et al 2011).</p> <p>The Puerco Project will retain all trees 24” DBH and larger, regardless of condition, as well as all trees exhibiting old tree characteristics as outlined in the Zuni Mountain CFLR Old Tree Retention Guidelines. In addition, because larger trees (18”+ DBH) are a key habitat correlate and are deficit across the landscape, removal of such trees will be done judiciously and only when truly necessary to meet specific resource objectives, but a strict 18” diameter limit is not proposed, per MSO Recovery Plan Direction.</p>
7b	
	<p><i>Comment: “QUESTION: Why does the project propose that 10% of the PIPO-QUGA type will be managed for MSO Recovery Nest-Roost minimum desired conditions? How did you arrive at 10%. Similarly, how did you arrive at 25% for the mixed conifer type?”</i></p> <p><i>“RECOMMENDATION: We would suggest managing more of the PIPO-QUGA type for these conditions, especially where current conditions are meeting or near meeting the</i></p>

required structural attributes.”

Response: These values come from the MSO Recovery Plan (2012), page 278.

Table C.3. Minimum desired conditions for mixed-conifer and pine-oak forest areas managed for Recovery nesting/roosting habitat.

EMUs Forest Type	% of Area ¹	% BA by Size Class		Minimum Tree BA ²	Minimum Density of Large Trees ³
		12-18” DBH	>18” DBH		
BRE Mixed Conifer	20	>30	>30	145	15
CP, UGM, SRM, BRW Mixed-conifer	25	>30	>30	120	12
CP ⁴ , UGM, BRW Pine-oak	10	>30	>30	110	12

1 - % of area pertains to the percent of the planning area, subregion, and/or region in the specified forest type that should be managed for threshold conditions.

2 - BAs in m²/ha (ft²/acre), and include all trees >1 inch DBH (i.e., any species). We emphasize that values shown are **minimums**, not targets.

3 - Trees > 46 cm (18 inches) DBH. Density is tree/ha (trees/acre). Again, values shown are minimums rather than targets. We encourage retention of large trees.

4 - Pine-oak forest type: ≥10% of the stand BA or 4.6 m²/ha (20 ft²/ac) of BA consist of Gambel oak ≥ 13 cm (5 in) drc.

5 - Pine-oak recommendations apply only to the Mount Taylor and/or Zuni Mountains regions within the Colorado Plateau (CP) Ecological Management Unit (EMU).

7c

Comment: “CONCERN: Table 3.1.5 on page 69 of the Draft EA suggests that the immediate effects of thinning treatments would actually increase the proportion of VSS 4 trees (moving further away from desired proportions) and it would decrease the proportion of VSS 5 trees (again moving further away from desired proportions). This is confirmed in the statement in the Draft EA that “the majority of basal area currently in the mid-aged stages (5-18” DBH),” the statement that “The existing condition for both ponderosa pine and piñon-juniper woodland is deficient of trees greater than 18” DBH and 12” DRC,” (Draft EA, page 60), as well as in Table 3.1.6. Also, an overall shrinking in the project-level mean tree diameters is predicted following treatment for mixed conifer, ponderosa pine, and PIPO-QUGA types, according to a comparison between tables 3.1.7 and 3.1.8. Taken together, these figures suggest that thinning will not be focused predominantly in the VSS 3 and VSS 4 classes (which are most overrepresented), and that a significant amount of removal of VSS 5 trees will be included (which are below desired conditions).”

“RECOMMENDATION: Per Table 3.1.5 on page 69 of the Draft EA, it appears that there is a dramatic deficit of VSS 5 and VSS 6 trees. Recruitment into the upper VSS classes is

urgent, and can be achieved sooner than the 30-year planning horizon if more of these 18”+ trees are maintained on the landscape. Maintaining existing 18”+ trees is badly needed in order to move towards forest plan desired conditions of 20% VSS 5 and 20% VSS 6. We recommend utilizing an 18” cutting limit with some exceptions, similar to the “Old and Large Tree Protection Strategy” developed by the 4FRI Stakeholders Group (attached to these comments). The strategy, if adopted, would provide the protection for VSS 5+ trees that is needed for meeting forest plan conditions, while providing some flexibility to achieve other restoration objectives. Incorporation of a modified version (tailored to the Puerco landscape) should not eliminate the overall 24” cutting limit, nor would it override the 18” cutting limit in PIPO-QUGA type, discussed above. We would gladly meet with the Project planning staff and discuss the details of such a strategy, and assist in developing the language.”

Response: Table 3.1.5. Vegetative Structural Stage Analysis – One Scale below EMA (Puerco Project Area), which displays the results of Forest Vegetation Simulator (FVS) modeling of the Proposed Action, does in fact show a temporary decrease in the proportion of VSS5 trees from 15% to 13% immediately post treatment. This is because the proposed action was not modeled with an 18” diameter limit and the reduction in these trees is in large part the result of dwarf mistletoe sanitation. Of note is that the combined percentage of VSS5 & VSS6 post treatment remains the same, at 17%, and the minor reduction in VSS5 is made for by an increase in VSS6. In addition, 30 years after treatment the percentages of VSS5 and VSS6 both double, reflecting better growing conditions and increased vigor as a result of reduced competition.

The fact that FVS modeling indicates that VSS4 will actually increase post treatment is attributed to the Proposed Action’s sincere focus on concentrating thinning on the smallest of the most overstocked size classes. Also, it is widely accepted that desired VSS distributions (uneven-aged conditions) can rarely be met after one harvest entry, and the intent is to maintain a surplus of the larger mid-aged trees (VSS4) to move into the VSS5 and VSS6 classes over time.

The “overall shrinking in the project-level mean tree diameters is predicted following treatment for mixed conifer, ponderosa pine, and PIPO-QUGA types, according to a comparison between tables 3.1.7 and 3.1.8” noted in the comment is because Table 3.1.7 shows FVS modeling results of No Action after 30 years of growth and no fire. Table 3.1.8 displays post treatment FVS modeling results, without 30 years of growth. Even after 30 years of growing under No Action, trees will continue to grow. The better table for comparison is Table 3.1.9, which displayed post treatment conditions after 30 years and predicted that project-level mean tree diameters will increase for all but ponderosa pine.

The Forest Silviculturist double-checked the project data and found that values for 2 columns (QMD- Quadratic Mean Diameter and DMR – Dwarf Mistletoe Rating) were

	incorrectly transcribed, and adjusted the table for the Final EA. QMD for Ponderosa pine 30 years post-treatment was actually 14.1 DBH, an increase over No Action after the same amount of time. Table 3.1.9 has been corrected.
7d	
	<p>Comment: “Our main concern with regards to treatments in PACs is in post-treatment monitoring and adaptive management. We will be looking closely at the projects Biological Opinion regarding monitoring of treatment effects on owl survival, occupancy, breeding, etc. It would be good if the BO was available for review prior to the issuance of a Draft Decision. Other projects in the southwest have recently issued DDN’s without complete BO’s. We are increasingly concerned that multiple projects region-wide are beginning intensive PAC treatments without fully understanding the effects. The Puerco project should be nested within a larger regional monitoring and experimental framework, such as treatments on 4FRI and the South Sacramento restoration Project (Lincoln NF).”</p> <p>Response: Treatments in PACs would follow direction contained in the MSO Recovery Plan (2012): Table C.2. - Generalized description of key habitat variables comprising Desired Conditions in forest, riparian, canyon, and woodland cover types typically used by Mexican spotted owls for nesting and roosting (pages 275-277). Desired conditions in Table C.2 will guide management within PACs and recovery nest/roost habitats.</p> <p>There is no Biological Opinion (BO), the determination is may affect, not likely to adversely affect. A BO is only written if there is a likely adverse effect. The Biological Assessment has been sent to the US Fish and Wildlife Service for review and once they have reviewed it they will respond with a concurrence/or non-concurrence letter, which will be in the project record.</p>
7e	
	<p>Comment: “The Ecological Restoration Institute recently released a new publication titled “Restoration as a Mechanism to Manage Southwestern Dwarf Mistletoe in Ponderosa Pine Forests” (attached to these comments). While the working paper does suggest that even-aged management is an appropriate response to moderate to severe infections, it is in the context of even aged groups separated by 40-80 feet between groups. It does not suggest even-aged approaches at scales larger than the group level. Of more importance, the report suggests that in severely infected stands, manager should use fire only, and that severely infested stands may be deferred and allowed to burn or left as wildfire habitat. Of most importance is the recommendation to retain presettlement trees, even if dwarf mistletoe is present. In the Puerco project, this would include many VSS 5 trees that may otherwise be targeted for removal because of mistletoe. “</p> <p>“RECOMMENDATION: The Puerco project should add language to the EA specifying that severe mistletoe infected stands/groups in the VSS 5 and VSS 6 classes should be deferred from treatment, rather than liquidating old and large trees under an even-aged management or sanitation approach. Mistletoe treatments should be focused on smaller and medium size</p>

	<p><i>classes. The Final EA should provide a table that breaks down mistletoe severity by stand-size classes, so it is easier to identify which acres (VSS 3 and VSS 4 stands, predominantly) should be targeted for mistletoe treatments.”</i></p>
	<p>Response: Thank you providing the ERI document Restoration as a Mechanism to Manage Southwestern Dwarf Mistletoe in Ponderosa Pine Forests, which was made available after the release of this Draft EA. This document will be considered for the Final EA and incorporated into the Project Record. The Zuni Mountain CFLR Old Tree Retention Guidelines will protect most pre-settlement trees, even if dwarf mistletoe is present. However, it is correct that some VSS5 trees (18-24” DBH) that do not exhibit old tree characteristics could be targeted for removal under the current Proposed Action.</p> <p>For the ponderosa pine and pine-oak, the Proposed Action includes language that during project layout, if field validation shows that mistletoe infection levels are so severe that an uneven-aged prescription would not move stands toward conditions, then an intermediate thinning would be prescribed and regeneration would not an objective until maturity or beyond. In addition, intermediate thinning would generally focus on retaining the best dominant and codominant trees with the least amount of mistletoe. Improved growth and vigor of the best trees is a primary objective. Eventually, some proportion of these stands could be regenerated and replaced (with a follow-up treatment) and then, over time, converted to an uneven-age condition.</p> <p>This demonstrates the Forest’s willingness to consider current conditions and options that will move stands toward desired conditions, and not simply applying a “one size fits all” prescription. Where infection levels are so severe, employing an intermediate thinning strategy would retain the “best of the worst” infected trees by leaving dominant and codominant trees with the least amount of mistletoe. Although initial stand data indicates that approximately 5,900 acres (6% of the project area) have been identified as potentially suitable for more intensive even-aged management, field validation has not confirmed this and initial renaissance indicates that more acres can be treated with the standard uneven-aged treatment that will sanitize dwarf mistletoe and still retain basal area levels stated in the proposed action (22 to 89 ft², DEA page 36), but more toward the middle range. The Forest is willing to work with the Center on developing prescriptions for the most severely infected stands.</p>
<p>8 – Marina Bean</p>	
	<p><i>Summary: “I am writing to submit my public comment about the planned Puerco Collaborative Forest Landscape Restoration Project Environmental Assessment.</i></p> <p><i>I have attached a document from a compilation of emails and documents shared with me by John Trochet, Field Ornithologist for the Museum of Wildlife, Fish and Conservation Biology at University of California, Davis. He is a documented expert on birds of the Zuni Mountains.</i></p>

	<p><i>Dr Trochet's correspondences stated that the the Milk Ranch Canyon is the only location in the Zuni Region in which the Scarlet Tanager lives during part of its migratory cycle. The Scarlet Tanager is a migratory species and is protected by the Migratory Species Treaty Act of 1918.</i></p> <p><i>The Puerco CLFRP EA does not adequately address the full diversity of bird species in the Zuni Mountains. When I inquired at the July 18, 2018 I inquired of a Forest Service representative about data collection of avian populations in the Puerco Collaborative Forest Landscape Restoration Project area, I was told that the Forest Service is aware of the presence of the Mexican Spotted Owl and Northern Goshawk, but that they are not bird experts and have no data on most bird populations in the Zuni Mountains.</i></p> <p><i>I am concerned that this lack of data will result in unknown harms to various threatened and endangered, and migratory bird species without additional information.</i></p> <p><i>Over-application of fuel reduction activities and woodproduct removal combined with a lack of information about the bird species of the Zuni Mountains will likely result in damage to the habitat of migratory and protected bird species. The wording in the Puerco Collaborative Forest Landscape Restoration Project Environmental Assessment (see p.55), implies that harms to these species would be unintentional, but if additional data were collected, unintentional harms could be avoided.</i></p> <p><i>I've included the attached documents to demonstrate the level of knowledge of bird species in the Zuni Mountains that I would like the FLRP EA to contain before any significant actions are taken.</i></p> <p><i>Response:</i> The Scarlet tanager is an occasional migrant that has not been officially recorded in the Zuni Mountains. Planned treatments will be broken up into blocks and treated at different times (years in between treatments) for the protection of all bird species and the habitat they use. The recommended Migratory Bird timing restriction for no management activity is from April 1st-July 31st. This timing restriction does not apply to vegetation treatments under the Migratory Bird Treaty Act.</p>
9 – Brant Hayenga	
	<p>Summary/Comment: <i>“I am writing to comment on the Puerco Collaborative Forest Landscape Restoration Project Environmental Assessment. In 2003, the Record of Decision for the Bluewater environmental impact statement (EIS) for the eastern portion of the Zuni Mountains of the Cibola NF was signed. The Puerco Landscape Restoration Project continues that ecosystem restoration effort on about 81,000 acres covering the western portion of the Zuni Mountains. In the ROD for the Bluewater Ecosystem Management Project it was stated that the Bluewater Ecosystem Management Project “relies heavily on principles outlined in the study Ecological Restoration of Southwestern Ponderosa Pine</i></p>

	<p><i>Ecosystems: A Broad Perspective (Allen, et. al.,2002). ”</i></p> <p><i>“In the Allen, et. al. paper it was cautioned that, “Impatience, overreaction to crown fire risks, extractive economics, or hubris could lead to widespread application of highly intrusive treatments that may further damage forest ecosystems.” In spite of this cautionary statement, I believe that is precisely what happened in the eastern portion of the Zuni Mountains in the Bluewater Phase of this project. After multiple photos demonstrating that old growth trees larger than 26 inches in diameter were being cut were submitted to the Forest Service and other organizations, at a November 2015 CFLRP meeting, the Forest Service admitted that, “Mistakes had been made.”</i></p> <p>Response: Thank you for your interest and participation in the development of this project. Because of concerns that you raised, the Cibola Forest Supervisor, in November of 2015, implemented the Zuni Mountain CFLR Old Tree Retention Guidelines, which apply to the remaining acres scheduled for restoration in the Bluewater Project as well all acres within the Zuni Mountain CFLR footprint, which includes the Puerco Project. This is a prime example of the Cibola National Forest’s willingness to use the Adaptive Management process to adjust treatment prescriptions in order to achieve project objectives and move toward desired conditions.</p>
9a	
	<p>Comment: <i>“The recent Diener Canyon fire is a devastating example of the possible consequence of the management actions “further damaging forest ecosystems”. It is my understanding that the Diener Canyon fire was the result of a prescribed burn associated with the Zuni Mountains Collaborative Forest Landscape Restoration (CFLR) project. Diener Canyon was one of the most beautiful locations in the Zuni Mountains, but now is destroyed, and based on the nearby burn scar from the Sedgwick fire, will never regenerate.</i></p> <p><i>“There were monitoring and management policies in place for the Bluewater Phase, and yet mistakes were made: excessive cutting of old growth, prescribed burns becoming wildfires, and likely other harmful mistakes. The excessive cutting of old growth trees did not align with stated management goals. I do not believe the current assessment adequately ensures that additional permanent and devastating mistakes won’t be made during the Puerco Phase. I very much appreciate and support the Zuni Mountain CFLR Old Tree Retention Guidelines (pg. 258 from Environmental Assessment). But, I would like more robust monitoring and oversight, along with greater transparency about how many old trees are being cut. The mistakes of the past have greatly diminished my confidence that the Old Tree Retention Guidelines will be followed.”</i></p>
	<p>Response: (https://www.fs.usda.gov/detail/cibola/home/?cid=FSEPRD576933)</p> <p>We were aware of the forecasted winds; the winds were a part of our burn plan and part of our decision to proceed with the burn. We usually burn before a change in frontal passages to help move and disperse the smoke up and out of nearby communities. If we only burn under high pressure with low to no wind speeds, we could cause more health impacts from</p>

heavy smoke not being able to disperse and move out of nearby areas. Winds are part of the prescription that fire specialist monitor throughout the duration of the fire. Our windows of opportunity for prescribed fire in the southwest are narrow and must meet specific parameters, including current and expected weather conditions, fuel moisture levels, and available resources, before a burn can be implemented.

In open Ponderosa stands, we use wind as an effective tool to keep the canopy from scorching and to keep fire at the ground level. The actual winds we experienced were higher than forecasted. That's why we stopped burning early and mopped up and secured the fire. The next day, as anticipated, high winds occurred at 70 mph. We did not ignite the burn in red flag conditions. We stopped operations a day and a half early and burned 1,000 fewer acres than planned because of the predicted high winds. This allowed crews time to mop up and secure the boundaries. We were not burning under Red Flag conditions (strong, sustained winds).

While suppressing the Diener Canyon Fire, we received an additional smoke report near Bluewater Lake. Crews were immediately diverted to the Bluewater Fire. Within minutes, it grew from 1 acre to 50 acres in the high winds. By April 12th, it was about 500 acres. The Bluewater was not caused by the Redondo or Diener Canyon fires. A law enforcement investigation revealed that the Bluewater was started by an abandoned campfire.

	Bluewater	Diener	Total
Burn Severity NFS (acres):			
Unburned	659.65	2,734.85	3,394.50
Low	1,415.97	4,679.96	6,095.92
Moderate	849.10	1,615.26	2,464.37
High	495.84	307.44	803.28
Total (acres)	3,420.56	9,337.51	12,758.06

The majority (79%) of the Diener Canyon Fire burned at low severity or was unburned (7,415 acres), and only 3%, (307 acres) burned at high severity. The combination of strong, sustained winds, dense forest and topography in Diener Canyon combined to create conditions that were conducive to a stand-replacing crown fire. There were two treatment units scheduled for harvest that, if treated beforehand, could have helped reduce the fire's impact in Diener Canyon. Where the Bluewater fire burned into 500 acres of non-commercially thinned stands on top of Salitre Mesa (completed in 2017), the fire transitioned from crown to surface fire and the majority of those treated acres retained the overstory tree cover.

Areas burned in the Sedgwick Fire, along Forest Road 180 leading into the Bluewater

	<p>Project from Milan have naturally regenerated where adequate seed source was retained. A reforestation assessment for the Diener Canyon and Bluewater Fires is planned and actions will be proposed to reforest severely burned areas with the appropriate forest cover.</p> <p>Monitoring of treated areas has been on-going and is accomplished through daily project administration. Working with the Forest Steward’s Guild, 142 permanent monitoring plots were installed across the Zuni Mountain CFLRP in 2015, including within the Puerco Project area. In addition, stand exam data was collected from treated stands in 2015 and is in the process of being collected again in 2018 to compare pre- and post-treatment stand conditions. A summary of the 2015 data was presented at the Zuni Mountain Collaborative All Hands Meeting in 2015, and a similar summary of the data collected in 2018 will be available for the 2019 meeting.</p>
9b	
	<p>Comment: <i>“Fuel reduction activities and wood product removal have been excessive in the Bluewater Phase, and have resulted in “unintentional disturbance to migratory birds” (pg. 55 Environmental Assessment). It is not just migratory birds that have suffered unintentional disturbance. All wildlife inhabitants, and users of the forest have suffered the consequences.”</i></p> <p>Response: Fuel reduction and wood product removal have not been excessive, the Bluewater EIS approved restoring approximately 25,000 acres of ponderosa pine ecosystems by reducing stand density and utilizing prescribed fire to reduce fuel loads. The Bluewater Project analysis area is approximately 115,000 acres, thus upon completion, only 22% of the area will have been treated. One of several implementations of our restoration framework was on the Cibola National Forest (Bluewater demonstration project) in New Mexico in 2010 (Reynolds et al 2013). This restoration treatment succeeded in creating the key compositional and structural elements identified in our framework. The treatment retained the uneven-aged structure in the stand, increased the degree of interspersions of age classes, and is on a trajectory toward an approximate balance of age classes (Reynolds et al 2013).</p> <p>In regard to Migratory Birds, the Executive Order (2001) and implementing MOU with the US Fish and Wildlife Service (2008) require us to disclose where unintentional take reasonably attributable to agency action is having a negative effect on migratory bird populations. Since vegetation treatments are not take as determined by Seattle Audubon vs. Evans, there can be no unintentional take as a result of the proposed action for Puerco. Although not required, the use of implementation phases is an additional mitigation measure that has been implemented on the Cibola NF to further avoid disturbance to migratory birds. Reference(s) to unintentional take will be removed from the final EA to avoid confusion.</p>
9c	
	<p>Comment: <i>“Statements such as, “Healthy large trees should comprise the majority of the immediate foreground along designated unless doing so would not achieve project goals” (pg. 55) raise significant questions for me about the Forest Service’s ability to accomplish the stated goals, without excessive wood product removal. Does that statement imply that</i></p>

	<p><i>healthy large trees are available for cutting away from the foreground?”</i></p> <p>Response: This is from the desired conditions section for Scenic and Recreation Resources on page 52. Desired conditions are specific social, economic or ecological characteristics for part or all of the project area. They describe the aspirational picture of the Cibola NF. Projects and activities should be directed toward achieving these conditions. Adjacent to and within developed recreation sites, treatments will have a priority of maintaining recreational and scenic values, but within Management Area 2 – (33,590 acres of the project area) the primary management emphasis is on timber management (Cibola Forest Plan, page 84).</p> <p>The overall desired conditions for vegetation in the Puerco Project are for the composition, structure, and function of vegetative conditions to be resilient to the frequency, extent and severity of disturbances and climate variability. The mosaic of tree groups generally comprises an uneven-aged forest with all age classes present. Prescriptions will focus on the creation and maintenance of uneven-aged forest structure. Because there is an overall deficit of old and large trees, emphasis will be placed on retaining those trees. In addition, there is also a deficit in young trees (seedlings and saplings) so emphasis will also be placed on creating openings in the canopy to encourage natural regeneration.</p>
9d	
	<p>Comment: <i>“The Zuni Mountains are in need of management that reduces fire risk and returns the forest closer to its natural range of variability. But this needs to be accomplished without further damage to the forest ecosystem as has happened during the Bluewater Phase.”</i></p> <p><i>“I would like to see the Forest Service strive to use the least disruptive techniques, and balance intensity and extensiveness of treatments better than has occurred during the Bluewater Phase. In many areas, conservative initial treatments would be the minimum necessary to adequately reduce the threat of unnatural crown fire.”</i></p> <p>Response: Thank you for your interest and participation on the development of this project.</p>
10 – Susan Ostlie, Great Old broads for Wilderness	
	<p>Comment: <i>“General comment: There is much to be appreciated in this EA - in general, I found it to be reasonably thorough, balanced, and mostly readable, although the use of acronyms throughout sometimes made it difficult to have a coherent chain of thought. I had to spend so much time looking things up in the list of acronyms in the front of the document, and many times the acronyms were not found in this list. Therefore I had to reread previous paragraphs and even pages to find them. This was especially true in the headings for the various tables. There were some tables where I just gave up, because I never did find the meaning of the headings. (Table A-2, page 226, for example.)”</i></p> <p>Response: Thank you for your interest and participation in the Puerco Project. We will go through the document and define all the acronyms and tables.</p>
10a	
	<p>Comment: <i>“In Appendix A - Forest Plan Amendments - page 224. In the bold face type it</i></p>

	<p><i>lists the minimum restricted area for pine-oak to be up to 10% at 110-150 sq. ft. BA. This is the minimum threshold target value. This percentage seems too low for a minimum value, given the changing climate conditions, and the probability of catastrophic wildfires. It does not allow enough habitat for Mexican Spotted Owl recovery if anything goes wrong in the initial stages of the restoration project. Once the landscape has had some restoration work completed and fire has been reintroduced successfully onto the landscape, maybe that is an acceptable percentage, but it seems too low at this point in time. I say this because I observed the extensive damage to the mistletoe mitigated area in the Diener fire, and it seemed to be considerably beyond what might have been predicted. This may have been addressed in Table A-2, but I couldn't understand the headings on the table, and therefore, it didn't mean much to me. (See first comment.)"</i></p>
	<p>Response: The values provided in Table A-2 are from the Recovery Plan for the Mexican Spotted (USDI 2012) and are set by the US Fish and Wildlife Service. Managing for 110 to 150 square feet basal area is consistent with the minimum desired conditions for pine-oak forests managed for Recovery nesting/roosting habitat (page 278, table C.3 (USDI 2012)).</p>
10b	
	<p>Comment: <i>"In the prescriptions for Mexican Spotted Owl PAC, mechanical thinning up to 17.9" DBH is allowed, but this seems to be a greater size than necessary in such an important habitat. Given that there are so few trees left in the Zunis that meet this standard, consideration should be given to lowering that amount to <15", if it can be done without compromising the fire resilience of the habitat. (Page 230 and other areas of the EA.)"</i></p> <p>Response: The Puerco Project and all other projects that contain Mexican spotted owl habitat must adhere to guidelines provided in the Recovery Plan for the Mexican Spotted Owl (USDI 2012). The US Fish and Wildlife Service provides the following guidelines for MSO Recovery foraging/non-breeding habitats:</p> <ul style="list-style-type: none"> • Strive to retain (do not cut) all trees >61 cm (> 24 in) DBH, the average diameter of nest trees, unless overriding management situations require their removal to protect human safety and/or property (e.g., the removal of hazard trees along roads, in campgrounds, and along power lines), or in situations where leaving large trees precludes reducing threats to owl habitat (e.g., creating a fuel break). To the extent practical, fuel breaks should be designed to avoid the removal of larger trees (trees over 18 in [46 cm] DBH). <p>Guidelines for Forested Recovery Habitat Managed as Nest/Roost Habitat:</p> <ul style="list-style-type: none"> • Stand conditions that provide the owl's nesting habitat frequently vary above the minimum values given in Table C.3 (USDI 2012). Further, important stand conditions cannot be replaced quickly. In particular, removing large trees in a stand identified as habitat could reduce its suitability as nesting habitat or increase the time required to develop suitable nesting habitat. Because it takes many years for trees to reach large size, we recommend that trees ≥46- cm (18 inches) DBH not be removed in stands designated as recovery nest/roost habitat unless there are compelling safety reasons to do so or if it can be demonstrated that removal of those trees will not be detrimental to owl habitat.
10c	

	<p>Comment: “I do agree with the Guidelines for Retention of Pre-settlement Ponderosa Pine on page 243, although I would prefer that the leave tree DBH be reduced to >20”, at least in the initial stages of the restoration. Eventually, this range might be increased as the younger trees grow and enter this category. I support including trees with less than perfect form and snags.”</p> <p>Response: In addition to trees >24” diameter, Zuni Mountain CFLR Old Tree Retention Guidelines state that all trees with pre-settlement characteristics will be retained. This includes many trees that are less than 24” DBH. It also states that every effort should be made to conserve old trees to promote a balanced, uneven-aged forest condition that maintains, or contributes to the restoration of pre-settlement old growth conditions characteristic of the forest type. Prescriptions will maintain or move toward uneven-aged conditions at the stand and treatment unit (multiple stands) level, and because there is an overall deficit of old and large trees across the landscape the majority of these trees will be retained to maintain or move toward uneven-aged stand structure.</p>
10d	
	<p>Comment: “On page 254, Appendix D - Best Management Practices, the Management Zone for unmapped ephemeral streams is only 25 feet, whereas for mapped ephemeral streams it is 100 feet. While I understand that the unmapped streams are likely to be much smaller than the mapped streams, 25 feet seems like too small a zone. Many of these streams might occur in deeper arroyos, where erosion control and soil stability is already an issue. I would think that this might be a decision that should be made by the forest hydrologist or soil scientist on an as needed basis. Other than that, I support the setbacks for the management zone widths.”</p> <p>Response: There was a correction to the buffer width for mapped ephemeral streams, it is 50 feet. The width is on either side of the feature at the edge of the floodplain or in the case of gullied systems, at the edge of the gully. While 25 feet may seem like a small zone, it is adequate to retain trees that are providing stability. Where additional widths are determined to be needed, this zone can be increased on a case by case basis. In addition to the buffer widths, there are also other mitigations used to protect these features, including designated crossings for motorized vehicles, not locating decks or landings within these features, and protections during prescribed fires.</p>
10e	
	<p>Comment: “Under Environmental Consequences, page 184, Paragraph 1 of Alternative B, the last sentence discusses road decommissioning as funding allows. Funding should be built in over a given # of years - or at least within two or three years of completion of the initial stages of the restoration process. If it is not, the funding will just end up going by the wayside, and this excellent part of the proposal - no new roads will be created and 200 miles of user created roads will be decommissioned - will not happen.”</p> <p>Response: Funding for the Forest Service has steadily declined over the past several decades, including funds dedicated for basic road maintenance, much less for decommissioning and rehabilitating roads. Where unauthorized roads are utilized for forest</p>

	restoration, the operator will rehabilitate those roads as part of the stewardship agreement. Other funding sources will be sought that can target decommissioning of former system roads and rehabilitating unauthorized roads.
10f	
	<p>Comment: “The sections on Range Management indicates many improvements, especially on the Pruett/6A allotment. We were shown on a field trip before the scoping process one spring area that needed restoration, but is the collaborative necessarily responsible for all of these improvements? Should the permittees be making an effort to get the NRCS to help with the cost of these improvements? That is what the NRCS does, as far as I have been told, and it would seem that the EA has already been done for them. That could clear up some funding sources for the road decommissioning (see p. 184.)”</p> <p>Response: These projects were identified with permittees as important tools to improve rangeland and livestock management on their allotments. The implantation of these projects will be implemented over a period of years depending on funding from EQIP under NRCS as cost share, FS, personal funds or other funding sources.</p>
10g	
	<p>Comment: “For Aspen, Meadow and Spring Restoration, (page 179, second paragraph) It states, Fencing could be a method of aspen treatment. And in the third paragraph, Fencing may be constructed... I would like to see stronger language in these two places, as in fencing will be a method and fencing should/will be constructed. I have seen the results of this method of elk fencing used in the San Antonio creek area in the Jemez CFLRP and it is amazing how effective it is in just a few years.”</p> <p>Response: Fencing is definitely an effective option for protecting springs, meadows, aspen and riparian areas. However, with the construction of fences comes maintenance required to keep the fences functional, which is often beyond the capacity of the Forest Service under current budget and personnel levels. Because it is only one option available, we want to remain flexible in the choice of methods used, and apply the protection measure(s) that is best suited on a case by case basis.</p>
10h	
	<p>Comment: “Concerning the many discussions of the necessity of having an even-aged stand for areas with heavy mistletoe infestation, I think I now understand what is meant by that concept. As long as the leave trees include as many of the larger, older trees as possible, I don’t have the same objections as I did in the original scoping document. Again, I have seen two instances of mistletoe abatement restorations, one in the Bluewater area and one in the SW Jemez CFLRP (along FR 10, I think,) and both were particularly barren and unattractive. It seems like a tough problem to solve.”</p> <p>Response: Dwarf mistletoes are considered to be pathogens (disease-causing agents) of trees because of their damaging effects, which include growth reduction, deformities (notably the characteristic witches’ brooms), and decreased longevity. Essentially, these plants re-allocate growth to infected portions of the tree at the expense of the rest of the tree (Conklin and Fairweather 2010).</p>

	<p>Over time, infection centers generally become more open, with lower crown cover and basal area than the surrounding forest. Productivity (tree growth) declines markedly within these centers, and they may become dominated by stunted, deformed trees. Individual trees typically begin to experience measurable growth loss at DMR 4 (Hawksworth and Wiens 1996). Most infected trees survive for several decades, with larger infected trees usually surviving longer than smaller ones (Hawksworth and Geils 1990). As a general rule of thumb, DMRs of infected trees increase by 1 about every 10 years, and most DMR 6 trees die within 10 to 20 years. The rate of intensification usually decreases with increasing tree size. Infected seedlings and saplings rarely become large trees (Conklin and Fairweather 2010).</p> <p>Dwarf mistletoe treatments can leave an area looking “barren and unattractive”, but over the long term even-aged methods will improve forest health and can reset the trajectory toward a sustainable uneven-aged structure faster than other methods.</p>
10i	
	<p>Comment: “Table 1.4.2 on page 8 is particularly obscure. I did figure out through Wikipedia what QMD means and which of the two equations were used (the BA equation), although how the DMR5 fits into this whole table is still unclear to me. Maybe some additional footnotes or explanation might have been helpful.”</p> <p>Response: In an attempt to make Table 1.4.2, footnotes (4, 5, and 6) on the bottom of page 8 were used to help define and explain the terms and metrics displayed. DMR5 – the number 5 was the footnote number</p> <ul style="list-style-type: none"> • Quadratic Mean Diameter (QMD) is the diameter of the tree of average per tree basal area, which is considered more appropriate than arithmetic mean for characterizing a group of measured trees. • DMR is Dwarf Mistletoe Rating; the percentage of trees infected per acre. • Crowning Index is the open wind speed at which fully active crown fire is possible.
10j	
	<p>Comment: “Under Purpose and Need for Action - Recreation and Scenery Management - 3rd bullet (page 21), mitigating cross country travel by installing barriers in areas with large swaths of open ground sounds great, but I can’t recall seeing this done in the Bluewater restoration area. (Maybe this remains to be done?) At any rate, avoiding large open areas along travel routes would be highly desirable. I think in another section of this document, it is mentioned that larger openings would be located at a distance from travel routes, where they are not as visible. I certainly do support this concept.”</p> <p>Response: Mitigating cross country travel by installing barriers in areas with large swaths of open ground is listed as a desired condition, and is a mitigation measure that could be implemented depending on the circumstance and available funding to purchase and place such barriers.</p>
10k	

Comment: “On page 22 under Soil/Watershed - 5th bullet - it is not clear what a 12 digit subwatershed is, and I never did find an explanation.

Response: A systematic method of delineating watershed boundaries and giving them a number code was developed by the USGS (Seaber, Kapinos, & Knapp, 1987). The number code is called the hydrologic unit code (HUC). Each two digits refer to successively smaller watershed delineations within the previous two digits of the HUC. The analysis area is situated in eleven 12 digit watersheds, called Sub-Watersheds.

Sub-Watersheds within Puerco Analysis Area

HUC	Sub-Watershed	Acres of Analysis Area in Sub-Watershed	Percent	Watershed condition Rating (FS lands only)
150200040103	Cebolla Creek	8522	24.0	Functioning at Risk
150200060102	Fourmile Canyon-South Fork Puerco River	7344	23.1	Functioning Properly
150200060401	Headwaters Bread Springs Wash	949	4.4	Not Rated
130202070202	Headwaters Cottonwood Creek	23081	64.7	Functioning at Risk
150200040203	Middle Rio Nutria	10341	26.0	Functioning at Risk
150200060103	Milk Ranch Canyon	12380	65.1	Functioning at Risk
150200060104	Milk Ranch Canyon-South Fork Puerco River	13871	39.7	Functioning Properly
150200060501	Skeets Arroyo-Whitewater Arroyo	2370	7.2	Functioning Properly
150200060101	Smith Canyon-South Fork Puerco River	16272	43.1	Functioning Properly
150200040202	Stinking Spring	3426	22.0	Functioning Properly
150200040201	Upper Rio Nutria	19114	44.6	Functioning at Risk

101

Comment: “Under Ponderosa Pine Treatments on page 36 - 3rd bullet - the temporary openings of up to 4 acres or 200 feet wide, seems unnecessarily large. I have seen few if any

	<i>trees in the Zuni Mountains that could cast a shadow that large/long, which would allow excessive evaporation of snow on the ground. I would hope these areas would be few and far between. Maybe they would be needed for mistletoe mitigation, but other reasons are not apparent to me.</i>
	<i>Response:</i> This language comes from page 28 of GTR-217, Management Recommendations for the Northern Goshawk in the Southwest United States (Reynolds et al 1992), and also from page 71-7 of the Cibola NF Land and Resource Management Plan (ALRMP 1996). Openings of this size in the foraging area are preferred by the majority of the prey species (Reynolds 1992). Although GTR-217 and the ALRMP allow for openings of this size to be created, they are rarely done, even in stands heavily-infected with dwarf mistletoe.
10m	
	<i>Comment:</i> “Under Environmental Consequences on page 60 at the end of #14, it discusses retention of both Ponderosa Pine and Pinon/Juniper woodlands whose DBH is >18” and 12” drc. Does the drc refer to the piñon/juniper, and the DBH to ponderosa? This is unclear. I would think that drc would be larger than DBH, but maybe this is an incorrect assumption.
	<i>Response:</i> Yes, that is correct, 18” DBH is for ponderosa pine and 12” DRC is for pinyon-juniper species.

Response to Opposing Views Attachments

In addition to general comments, Mr. Dick Artley provided other literature and scientific studies in several attachments to his email. Some of this literature consisted of opinion pieces, editorials, articles, press releases, testimony, quotations, or stories from news outlets and a wide variety of internet sources. Many of these sources are not scientific, peer reviewed studies or literature. Peer review as well as the strength and specificity of the relationship between ideas, data, and inference distinguish scientific insights from opinion.

Members of the Puerco Collaborative Forest Landscape Restoration Project interdisciplinary team reviewed each of these sources and quotes, regardless of the nature of the source or whether it was an opinion, and considered them in light of the analyses completed in the EIS. Members of the interdisciplinary team are considered proficient in their field of study by way of academic achievement, agency training, years of professional experience, and in some cases, certification programs.

In addition, team specialists have cited numerous scientific studies and literature used to support discussions and conclusions made in this project’s analysis. The best available science was considered, as required by law, regulation, and policy. The citations contained in the comment letters and attachments were evaluated for applicability to this project proposal, and the findings discussed are below in Table 2. Mr. Dick Artley titles his documents as follows:

- Opposing views Attachment #1
- Opposing views Attachment #10
- Opposing views Attachment #11
- Opposing views Attachment #27
- Opposing Views Rogue Agency

Table E-3. Responses to Mr. Dick Artley’s Opposing Science Attachments for the Puerco Collaborative Forest Landscape restoration Project

Artley Citation	How Considered	Comment/Response	Submitted In:
Source of best science quotes below: How risk management can prevent future wildfire disasters in the wildland-urban interface By: David E. Calkin, Jack D. Cohen, Mark A. Finney, and Matthew P. Thompson Published in the Proceedings of the National Academy of Sciences, January 14, 2014 http://www.pnas.org/content/111/2/746.full	Limited Applicability	The Puerco Project is a restoration project that proposes to restore function and resiliency to the fire-adapted ecosystem, not just protect homes. <u>From the Discussion section:</u> <i>However, landscape condition cannot be ignored to realize fire-adapted communities because, by definition, WUI communities consist of more than homes. The wildland component defines the environmental context and values for communities, including views, recreation, watershed, and lifestyle benefits to the inhabitants. Home Ignition Zone (HIZ) practices that save all homes from wildfire but ignore severe impacts to the surrounding landscape cannot be wholly successful in creating a fire-adapted community. In fact, wildland values may be harder to restore, take longer, and be more expensive than reparations to the developed infrastructure. Thus, the goal of creating a fire-adapted WUI community is not achievable by focusing solely within the HIZ, but must encompass the land management options afforded by the ecological requirements of the wildland ecosystems.</i>	Opposing Views #11
Cohen, J. “Structure Ignition Assessment can Help Reduce Fire Damages in the WUI”, Fire Management Notes, Volume 57 No. 4, 1997,	Limited Applicability	The WUI areas contained within the Puerco Project are mostly undeveloped tracts of land. WUI areas. We agree	Opposing Views #11

http://www.fs.fed.us/rm/pubs_other/rmrs_1997_cohen_j001.pdf		that homeowners in WUI need to take an active approach in creating defensible space around their homes. However, we are not only in the protecting life and property business, The Puerco project is designed to restore natural processes and protect natural resources and wildlife habitat, in addition to private property and structures within the WUI.	
Cohen, J. “Reducing the Wildland Fire Threat to Homes: Where and How Much?”, Presented as the Fire Economics Symposium in San Diego, California on April 12, 1999., http://www.fs.fed.us/rm/pubs_other/rmrs_1999_cohen_j001.pdf	Limited Applicability	We agree that, “ <i>Home ignitability also dictates that effective mitigating actions focus on the home and its immediate surroundings rather than on extensive wildland fuel management</i> ”, and encourage all homeowners within a WUI setting to take appropriate measures to protect their property. See https://www.nfpa.org/Public-Education/By-topic/Wildfire/Firewise-USA	Opposing Views #11
Artley Citation	How Considered	Comment/Response	Submitted In:
Cohen, J. “Preventing Disaster Home Ignitability in the Wildland-Urban Interface”, Published in the Journal of Forestry 98(3): 15-21, 2000, http://www.nps.gov/fire/download/pub_public_preventingdisaster.pdf	Limited Applicability	See the previous rationale/comments. The Puerco project’s objectives are to restore ecological processes and function, and we encourage all home/property owners in the WUI to take appropriate measures to protect their property.	Opposing Views #11
Cohen, J. “Examination of the Home Destruction in Los Alamos Associated with the Cerro Grande Fire July 10, 2000” USDA Forest Service, Rocky Mountain Research Station, Missoula, Montana, 2000. http://www.fusee.org/docs/Preparedness/Cohen_examlosalamos%20copy.pdf	Limited Applicability	See the previous rationale/comments. The Puerco project’s objectives are to restore ecological processes and function, and we encourage all home/property owners in the WUI to take appropriate measures to protect their property.	Opposing Views #11

Cohen, J. “What is the Wildland Fire Threat to Homes?”, Presented as the Thompson Memorial Lecture, April 10, 2000, http://www.nps.gov/fire/download/pub_public_wildlandfirethreat.pdf	Limited Applicability	See the previous rationale/comments. The Puerco project’s objectives are to restore ecological processes and function, and we encourage all home/property owners in the WUI to take appropriate measures to protect their property.	Opposing Views #11
Cohen, J. “Saving Homes from Wildfires: Regulating the Home Ignition Zone”, Zoning News, May 2001, http://www.battle-creek.net/docs/fire/Zoning.pdf	Limited Applicability	See the previous rationale/comments. The Puerco project’s objectives are to restore ecological processes and function, and we encourage all home/property owners in the WUI to take appropriate measures to protect their property.	Opposing Views #11
Cohen, J. “Thoughts on the Wildland-Urban Interface Fire Problem”, June 2003, http://www.nps.gov/fire/download/pub_public_wildurbaninterface.pdf	Limited Applicability	See the previous rationale/comments. The Puerco project’s objectives are to restore ecological processes and function, and we encourage all home/property owners in the WUI to take appropriate measures to protect their property.	Opposing Views #11
Artley Citation	How Considered	Comment/Response	Submitted In:
Cohen, J. “The Wildland-Urban Interface Fire Problem: A Consequence of the Fire Exclusion Paradigm”, Forest History Today, Fall 2008; http://www.foresthistory.org/Publications/FHT/FHTFall2008/Cohen.pdf	Limited Applicability	See the previous rationale/comments. The Puerco project’s objectives are to restore ecological processes and function, and we encourage all home/property owners in the WUI to take appropriate measures to protect their property.	Opposing Views #11
Cohen, J., “Wildland-Urban Fire—A different approach”, http://www.nps.gov/fire/download/pub_public_wildlandurbanfire.pdf	Limited Applicability	See the previous rationale/comments. The Puerco project’s objectives are to restore ecological processes and function, and we encourage all home/property owners in the WUI to take appropriate measures to protect their property.	Opposing Views #11

Cohen, J. Fact Sheet: Understanding Fire and Fire Behavior, Ontario Aviation and Forest Fire Management, http://www.emifpa.org/PDF/FactSheetUnderstandingFire.pdf	Limited Applicability	See the previous rationale/comments. The Puerco project's objectives are to restore ecological processes and function, and we encourage all home/property owners in the WUI to take appropriate measures to protect their property.	Opposing Views #11
Source of best science quotes below: Wildfire Protection in the Wildland-Urban Interface CRS Report, January 30, 2014 https://www.everycrsreport.com/reports/RS21880.html	Limited Applicability	The Puerco Project proposes a more balanced approach to manage fire that protects not only adjacent homes, but entire ecosystems and watersheds. The proposed treatments will move these areas toward their desired conditions and help to reestablish functioning ecosystems that are sustainable and resilient. The proposed mechanical treatments (low thinning and uneven-aged selection cutting methods) are designed to establish openings and promote multi-aged stand structure, restore historic fire regimes, mitigate adverse effects of active crown fire, climate change and maintain or improve ecosystem health and function.	Opposing Views #11
Artley Citation	How Considered	Comment/Response	Submitted In:
Cushman, John H. Jr. "Audit Faults Forest Service on Logging Damage in U.S. Forests" New York Times, February 5, 1999 http://query.nytimes.com/gst/fullpage.html?res=9B00E2DF163BF936A35751C0A96F958260&sc=ec&spon=&pagewanted=print	Not Applicable	This 1999 article in the New York Times reported deficiencies in implementation of Forest Service timber sales between 1995 and 1998. It is not pertinent to this project because it is not site-specific to the project area, or to current management practices.	Opposing Views #1
Elliot, W.J.; Page-Dumroese, D.; Robichaud, P.R. "The effects of forest management on erosion and soil productivity." 1999. Proceedings of the Symposium on Soil Quality and Erosion Interaction, Keystone, CO, July 7, 1996. Ankeney, IA: Soil and Water Conservation Society. 16 p.	Not Applicable	The referenced paper discusses how extreme disturbances, such as wildfire or tractor logging, cause the loss of nutrients, mycorrhizae, and organic matter. Potential impacts to soil resources, mitigation measures and Best Management Practices are addressed in detail in the DEA.	Opposing Views #1

Franklin, Jerry F. Ph.D. and James K. Agee Ph.D. “Forging a Science- Based National Forest Fire Policy.” Issues in Science and Technology. 2007. A National Wildlife Federation publication sponsored by the Bullitt Foundation http://www.coastrange.org/documents/for e strep ort.pdf	Background information, consistent with the project.	In this article, a multi-disciplinary group of scientists discuss ecosystem based management approaches to keep watersheds and forests functioning properly.	Opposing Views #1
Franklin, Jerry Ph.D., David Perry Ph.D., Reed Noss Ph.D., David Montgomery Ph.D. and Christopher Frissell Ph.D. "Simplified Forest Management to Achieve Watershed and Forest Health: A Critique." 2000 http://www.coastrange.org/documents/for e strep ort.pdf	Background information, consistent with the project	In this article, a multi-disciplinary group of scientists discuss ecosystem based management approaches to keep watersheds and forests functioning properly.	Opposing Views #1
Source of best science quotes below: Fourmile Canyon Fire Findings By Russell Graham, Mark Finney, Chuck McHugh, Jack Cohen, Dave Calkin, Rick Stratton, Larry Bradshaw, and Ned Nikolov Published in USDA Forest Service Gen. Tech. Rep. RMRS-GTR-289. 2012 https://www.fs.fed.us/rm/pubs/rmrs_gtr289.pdf	Background information, consistent with the project	Additional quotes that where not mentioned in Mr. Artley’s comment: <ul style="list-style-type: none"> • <i>The treated areas were small and narrow. They ranged from less-than 1 acre to 52 acres in size and only 4 units were greater than 20 acres in size.</i> • <i>No performance metrics were defined for the fuel treatments. In other words, the environmental conditions in which the treatments were to be effective in modifying fire behavior or burn severity were not defined.</i> • <i>Thinning trees to a specified density (residual basal area) or spacing was the prescription often negotiated with land owners. In addition, the treatments were often focused on improving the health of the forest (removing diseased and malformed trees, i.e., dwarf mistletoe) rather than designed to modify fire behavior if a fire was to occur.</i> <p>The small size of treated areas were insufficient to alter the fire progression, and were not intended to defend against a fire burning with high winds. This is also reinforced by the “negotiated” prescription with land owners, which undoubtedly did not create canopy openings abundant or large</p>	Opposing Views #11

		enough to deter a crown fire.	
Source of best science quotes below: The Big Lie: Logging and Forest Fires By Dr. Chad Hanson http://yeoldeconsciousnessshoppe.com/art6.html	Not Applicable	This is an old (2000) opinion piece, not peer reviewed literature. It discusses the author's opposition to the timber industry and logging on public land, particularly clearcutting in the Pacific Northwest. The Puerco Project does not propose clearcutting, does not propose to target large trees, and utilizes a large/old tree retention strategy, the project proposes to (DEA page 29)	Opposing Views #11
Hansen, Chad "Ending Timber Sales on National Forests: THE FACTS (FY '97)" Published in the Earth Island Journal, 1999. http://www.johnmuirproject.org/pdf/Fy-1997-Economic-Report-Ending-Timber-Sales.pdf	Not Applicable	This is another old (1999) opinion piece, not peer reviewed literature. It discusses the author's opposition to logging on public land, particularly clearcutting in the Pacific Northwest. The Puerco Project does not propose clearcutting.	Opposing Views #1
Artley Citation	How Considered	Comment/Response	Submitted In:
Harvey, A. E., M. J. Larsen, and M. F. Jurgensen "Distribution of Ectomycorrhizae in a Mature Douglas- fir/larch Forest Soil in Western Montana" Forest Science, Volume 22, Number 4, 1; December 1976 , pp. 393-398(6) http://www.ingentaconnect.com/content/sa/fs/1976/00000022/00000004/art00007.jsessionid=12sdf2hphia2.alexandra	Background information, consistent with the project	The Puerco Project contains about 800 acres (1%) of mixed conifer, which includes Douglas-fir. Potential impacts to soil resources, mitigation measures and Best Management Practices are addressed in detail in the DEA.	Opposing Views #1

Higgins, Margot “National forest logging is bad business, study says” Posted on CNN.com- Nature, March 16, 2000 http://edition.cnn.com/2000/NATURE/03/16/forest.logging.enn/index.html	Not Applicable	This article is 18 years old and refers to logging for commodity production. The purpose of the Puerco Project is to restore historic conditions that allowed fire to maintain these fire adapted ecosystems. The Puerco Project is not a timber sale, it is a implemented under a stewardship agreement with the National Wild Turkey Federation.	Opposing Views #1
Hudak, Mike Ph.D. “From Prairie Dogs to Oysters: How Biodiversity Sustains Us” from his book review of The Work of Nature: How the Diversity of Life Sustains Us by Yvonne Baskin, 1997 Newsletter of Earth Day Southern Tier, February/March 1999, p. 2 http://www.mikehudak.com/Articles/FromPrairieDogs9902.html	Not Applicable	Quotes two sentences that are not applicable to this project: 1. “ <i>Human tampering with nature has not been without costs.</i> ” The 3 bullets below this statement reference Gypsy moth introduction, Eurasian cheatgrass, and goats. 2. “ <i>Human manipulation of existing ecosystems has also sometimes had unfortunate consequences.</i> ” This statement references Forest clearcuts in the Pacific Northwest and monoculture plantings of crops or timber.	Opposing Views #1
Ingalsbee, Timothy Ph.D. "Logging for Firefighting: A Critical Analysis of the Quincy Library Group Fire Protection Plan." Unpublished research paper. 1997. http://www.fire-ecology.org/research/logging-for-firefighting_2.htm	Not Applicable	Specific to the Quincy Library Group Fire Protection Plan, a project that was implemented in northern California.	Opposing Views #1
Artley Citation	How Considered	Comment/Response	Submitted In:

Ingalsbee, Timothy Ph.D. “Logging without Limits isn't a Solution to Wildfires” published in the Portland Oregonian, August 6, 2002 http://www.klamathforestalliance.org/Documents/loggingwithoutlimits.html	Not Applicable	Not peer reviewed, opinion piece from 2002, pertains to the Pacific northwest	Opposing Views #1
Ingalsbee, Timothy Ph.D. “A Reporter's Guide to Wildland Fire.” Published by the Firefighters United for Safety, Ethics, and Ecology (FUSE), January 2005 http://www.commondreams.org/news2005/0111-14.htm	Not Applicable	Timber Harvest Opposing View: <i>“Otherwise, reporters play into the hands of powerful interests who seek to profit from public perceptions of wildland fires as “catastrophes” and “crises.” For example: Government agencies who gain enormous powers to fight fires without any fiscal constraint or public accountability, and private logging companies who gain windfall profits from “salvage” logging burned trees with little or no regulatory restraint, both under self-proclaimed “states of emergency.”</i> The Puerco Project does not propose to salvage burned trees, rather restore fire to the landscape to avoid potentially catastrophic losses from wildfire.	Opposing Views #1
Jalkotzy, M.G., P.I. Ross, and M.D. Nasserden. “The Effects of Linear Developments on Wildlife: A Review of Selected Scientific Literature.” Prepared for Canadian Association of Petroleum Producers. Arc Wildlife Services Ltd., Calgary. 1997. 115pp. http://www.capp.ca/getdoc.aspx?DocId=24902&DT=PDF	Not Applicable	This a review of scientific literature from 1997 describing the effects of linear developments on wildlife, especially large mammals. Of particular interest were the types of roads and linear developments created by the oil and pipeline industries in western Canada. The Puerco project does not propose to build any new roads.	Opposing Views #1
Artley Citation	How Considered	Comment/Response	Submitted In:

John Muir Project “Protection of Post-Fire Habitat”, Published by the John Muir Project, 2014, http://johnmuirproject.org/forest-watch/post-fire-habitat/	Not Applicable	The Puerco Project does not propose to salvage burned trees, rather restore fire to the landscape to avoid potentially catastrophic losses from wildfire.	Opposing Views #1
Keene, Roy “Restorative Logging? More rarity than reality” Guest Viewpoint, the Eugene Register-Guard, March 10, 2011 http://eugeneweekly.com/2011/03/03/view/s3.html	Not Applicable	Not peer reviewed, opinion piece	Opposing Views #1
Keppeler, Elizabeth T. Robert R. Ziemer Ph.D., and Peter H. Cafferata "Effects of Human- Induced Changes on Hydrologic Systems." An American Water Resources Association publication, June 1994. http://www.fs.fed.us/psw/publications/zie/zie94a.PDF	Not Applicable	This study addresses hillslope drainage processes by comparing pre- and post-harvest pore pressure levels and soil moisture conditions on a steep hillslope within a zero order basin in coastal northwestern California. This area has very different soils, moisture distribution, climate, and vegetation than the Puerco Project area.	Opposing Views #1
Klein, Al “Logging Effects on Amphibian Larvae Populations in Ottawa National Forest.” 2004. http://underc.nd.edu/assets/216499/fullsize/klein2004.pdf	Not Applicable	The paper does not provide site-specific nor species-specific information relative to Puerco Project area. Potential effects to amphibians and mitigation measures are discussed in the Wildlife Specialist’s Report and DEA.	Opposing Views #1
Long, Richard D., U.S. Department of Agriculture Office of Inspector General "Western Region Audit Report: Forest Service National Fire Plan Implementation" Report No. 08601-26-SF, November 2001. http://www.usda.gov/oig/webdocs/08601	Not Applicable	This report presents the results of the Inspector General’s 2001 review of the Forest Service’s implementation of the National Fire Plan. This report has no bearing on this project.	Opposing Views #1
Mann, Charles C. Ph.D. and Mark L. Plummer Ph.D. “Call for 'Sustainability' in Forests Sparks a Fire” Science 26 March 1999: Vol. 283. no. 5410, pp. 1996 – 1998 http://www.sciencemag.org/content/283/5410/1996.summary	Supports Analysis	Not a peer reviewed scientific document. This article discusses the process of developing the new Forest Service manual “Ecological Restoration and Resilience” FSM 2000 CH2020, which was used to help develop the Purpose & Need for action for Puerco Project.	Opposing Views #1
Artley Citation	How Considered	Comment/Response	Submitted In:

Maser, C. Ph.D., and J. M. Trappe Ph.D. “The Seen and Unseen World of the Fallen Tree”, 1984 USDA Forest Service, GTR- PNW- 164 http://www.fs.fed.us/pnw/publications/pnw_gtr164/	Not Applicable	This article discusses the importance of down woody material in Douglas- fir forests on the westside of the Cascade Mountains (not applicable to the SW United States). Down woody material is managed as an important resource in the Puerco Project with consideration of recommended fuel loads, particularly for wildlife habitat as directed by the Cibola Forest Plan.	Opposing Views #1
Maser, C. Ph.D., R. F. Tarrant, J. M. Trappe Ph.D., and J. F. Franklin Ph.D. “The Forest to the Sea: A Story of Fallen Trees”. USDA Forest Service, GTR- PNW-GTR-229. 1988. http://www.fs.fed.us/pnw/publications/pnw_gtr229/	Not Applicable	This publication discusses large, fallen trees in various stages of decay contribute much-needed diversity of ecological processes to terrestrial, aquatic, estuarine, coastal beach, and open ocean habitats in the Pacific Northwest. This is not applicable to the Puerco Project, see previous comment/response	Opposing Views #1
McIntosh, B.A., J.R. Sedell, J.E. Smith, R.C. Wissmar S.E. Clarke, G.H. Reeves, and L.A. Brown “Management history of eastside ecosystems: changes in fish habitat over 50 years, 1935-1992.” 1994 GTR-321 93-181 http://www.fs.fed.us/pnw/publications/pnw_gtr321/	Not Applicable	This reference is from 1994 and is specific to eastern Oregon. The Puerco Project does not propose building any new roads, and incorporates Mitigation Measures including BMPs, to protect aquatic habitats from potential negative effects.	Opposing Views #1
Moring, John R. Ph.D. “The Alsea Watershed Study: Effects of Logging on the Aquatic Resources of Three Headwater Streams of the Alsea River, Oregon – Part III.” Fishery Report Number 9, 1975. Oregon Department of Fish and Wildlife. http://www.for.gov.bc.ca/hfd/library/ffip/Moring_JR1975b.pdf	Not Applicable	This reference is from 1975 and is specific to eastern Oregon. The Puerco Project does not contain any headwater streams and does not propose building any new roads, and incorporates Mitigation Measures including buffer strips BMPs, to protect aquatic habitats from potential negative effects.	Opposing Views #1
Artley Citation	How Considered	Comment/Response	Submitted In:

Multiple Polls (1-16) from around the United States asking for opinions on recreation preferences and opportunities. http://www.brspoll.com/Reports/report-final.pdf	Not Applicable	The Puerco Project is guided by direction in the Cibola Forest Plan. The analysis is not based on polls or surveys. An open, public involvement process was used to solicit input to the proposal between 2017 and 2018. These polls are not relevant to this project analysis.	Opposing Views #10
Multiple Sources Photos of various projects on USFS land throughout the West that contained the word “Restoration” in the title.	Not Applicable	The Puerco Project is designed to restore forest conditions that conducive to frequent low-intensity fire. The project does not include any clearcutting.	Opposing Views #27
Naeem, Shahid Ph.D., F.S. Chapin III Ph.D., Robert Costanza Ph.D., Paul R. Ehrlich Ph.D., Frank B. Golley Ph.D., David U. Hooper Ph.D. J.H. Lawton Ph.D., Robert V. O’Neill Ph.D., Harold A. Mooney Ph.D. Osvaldo E. Sala Ph.D., Amy J. Symstad Ph.D., and David Tilman Ph.D. "Biodiversity and Ecosystem Functioning: Maintaining Natural Life Support Processes." Issues in Ecology No. 4. Fall 1999. http://www.esa.org/science_resources/issues/TextIssues/issue4.php	Background information, consistent with the project.	Diversity is addressed in the 1996 Cibola LRMP through management direction to protect and perpetuate plant and animal communities and ensure as much diversity as possible, and Regional Forester’s direction and designations of sensitive wildlife and plant species. Biodiversity is preserved in this project by following Forest Plan requirements.	Opposing Views #1
Noble, Ian R. and Rodolfo Dirzo Ph.D. "Forests as Human-Dominated Ecosystems." Science Vol. 277. No. 5325, pp. 522 - 525. 25 July 1997. http://www.sciencemag.org/content/277/5325/522.abstract?maxtoshow=&HITS=10&hits=10&R	Not Applicable	"Agroforestry does reduce biodiversity. In forests used for logging, whole-landscape management is crucial." The Puerco Project is a landscape scale restoration project that does not promote agroforestry.	Opposing Views #1
Okoand Ilan Kayatsky, Dan. “Fight Fire with Logging?” Mother Jones, August 1, 2002 http://motherjones.com/politics/2002/08/fight-fire-logging	Not Applicable	Not peer reviewed, opinion piece from 2002. Timber Harvest Opposing View, “ <i>Still, forestry experts warned in the 2000 plan that logging should be used carefully and rarely; in fact, the original draft states plainly that the "removal of large merchantable trees from forests does not reduce fire risk and may, in fact, increase such risk."</i> The Puerco Project proposes uneven-aged management and incorporates a large and old tree	Opposing Views #1

		retention strategy.	
Artley Citation	How Considered	Comment/Response	Submitted In:
Partridge, Arthur Ph.D., Statement at a Press Conference with Senator Robert Torricelli about S. 977 and HR 1376), the Act to Save America’s Forests, April 28, 1998, U.S. Capitol http://www.saveamericasforests.org/news/ScientistsStatement.htm	Not Applicable	The Puerco Project does propose salvage logging, clearcutting, or road building.	Opposing Views #1 & 11
Raven, Peter, Ph.D., from his February 9, 2001 letter to Senator Jean Carnahan http://www.saveamericasforests.org/Raven.htm	Not Applicable	This 1998 letter to Senator Jean Carnahan is an opinion piece that discusses harvest of ancient forests; clearcutting; harvesting roadless areas; and logging in certain special forest areas. The Puerco Project does not enter any roadless areas and does not propose clearcutting.	Opposing Views #1
Raven, Peter, Ph.D., Jane Goodall, C.B.E., Ph.D., Edward O. Wilson, Ph. D. and over 600 other leading biologists, ecologists, foresters, and scientists from other forest specialties. From a 1998 letter to Congress. http://www.saveamericasforests.org/resources/Scientists.htm	Not Applicable	This 1998 letter to Congress advocates the Act to Save America's Forests. This project aligns very well with the Act by not proposing clearcutting and utilizing modern scientific understandings of southwestern forest ecosystems to restore fire and historic structure.	Opposing Views #1
Reinhardt, Elizabeth D. ; Robert E. Keane ; David E. Calkin; Jack D. Cohen “Objectives and considerations for wildland fuel treatment in forested ecosystems of the interior western United States.” Forest Ecology and Management 256: 1997-2006. 2008. http://www.firewise.org/Information/Resources/	Not Applicable	The WUI areas contained within the Puerco Project are mostly undeveloped tracts of land. WUI areas. We agree that homeowners in WUI need to take an active approach in creating defensible space around their homes. However, we are not only in the protecting life and property business, The Puerco project is designed to restore natural processes and protect natural resources and wildlife habitat, in addition to private property and structures within the WUI.	Opposing Views #11
Rudzitis, Gundars. “Amenities Increasingly Draw People to the Rural West” Rural Development Perspectives, vol. 14, no. 2, 1999 http://www.ers.usda.gov/publications/rdp/rdpsept99/rdpsept99b.pdf	Not Applicable	Quotation references opinion poll information gathered from newcomers to the rural west. It is not a scientific peer reviewed document.	Opposing Views #1

Puerco Collaborative Forest Landscape Restoration Project
Appendix E – Response to Comments

Artley Citation	How Considered	Comment/Response	Submitted In:
Scott, Mark G. “Forest Clearing in the Gray’s River Watershed 1905-1996” A research paper submitted in partial fulfillment of the requirements for the degree of Master Of Science In Geography Portland State University, 2001 http://www.markscott.biz/papers/grays/chapter1.htm	Not Applicable	Timber Harvest Opposing View “Logging simplifies forest ecosystems by narrowing the age range of the stand and suppressing diversification through repeated harvesting, burning to remove slash, and replanting with hybrid seedlings. The Puerco Project proposes increasing the complexity through uneven-aged management, and does not propose any clearcutting.	Opposing Views #1
Short, Brant, Ph.D. and Dayle C. Hardy-Short Ph.D. "Physicians of the Forest": A Rhetorical Critique of the Bush Healthy Forest Initiative” Electronic Green Journal, Issue #19, December 2003 http://escholarship.org/uc/item/4288f8j5	Not Applicable	This article explores national debate over federal fire policy that emerged during the 2002 fire season in the United States and the ensuing shift in ideology that culminated in the Bush Administration's Healthy Forest Initiative. Outside the scope of this project.	Opposing Views #1
Slaymaker, Olav Ph.D. “Assessment of the Geomorphic Impacts of Forestry in British Columbia” AMBIO: A Journal of the Human Environment 29(7):381-387. 2000 http://www.bioone.org/doi/abs/10.1579/0044-7447-29.7.381	Not Applicable	The abstract states that The Forest Practices Code (1995) is a significant step towards sustainable management of the land in so far as it attempts to minimize these geomorphic impacts of forest in British Columbia, Canada. Forestry in the U.S. on NFS lands complies with many laws and regulations including the 1897 Organic Act, the 1972 Clean Water Act and incorporates national level Best Management Practices.	Opposing Views #1
Source of best science quotes below: Everything you wanted to know about wildland forest fires but were afraid to ask Published by the Wild Nature Institute, April 9, 2018 https://phys.org/news/2018-04-wildland-forest.html	Limited Applicability	<i>“According to the (Sierra Nevada, Klamath-Siskiyou), time since fire is not associated with increasing fire risks due to fuel build-up—actually the opposite is true because as these forests mature, they become less flammable. At regional scales, active management (unspecified forms of logging) has been associated with higher levels of high-severity fires, indicating logging tends to heighten fire risk. Most importantly, thinning efficacy is limited under extreme fire weather, the principal factor governing large fires.”</i>	Opposing Views #11

Puerco Collaborative Forest Landscape Restoration Project
Appendix E – Response to Comments

		<p>The Sierra Nevada, Klamath-Siskiyou forests being referred to are not frequent-fire forest types like those in the Puerco Project.</p> <p><i>"Weather-driven wildland fires, the main factor in the largest wildfires, cannot be stopped until the weather changes, yet they incur excessive costs and firefighter risks during ineffective fire suppression. Funding for widespread thinning and suppression would be better spent helping communities prepare for fire via defensible space."</i></p> <p>This statement is partially opinion; weather conditions and funding decisions are beyond the scope of this project.</p>	
<p>Wuerthner, George "Who Will Speak For the Forests?" New West, January 27, 2009 http://www.newwest.net/topic/article/who_will_speak_for_the_forests/C564/L564/</p>	Not Applicable	<p>This is an opinion piece describing potential resource impacts from logging activities in Blackfoot Clearwater Stewardship Proposal in Montana. The Puerco Project contains design features and mitigation measures to minimize potential impacts.</p>	Opposing Views #1
<p>Wuerthner, George "Why are Conservation Groups Advocating Logging Public Forests?" Published by Counterpunch, September 27, 2012 http://www.counterpunch.org/2012/09/27/why-are-conservation-groups-advocating-logging-public-forests/</p>	Not Applicable	<p>Timber Harvest Opposing View <i>"Indeed, the major justifications given for logging public lands is typically some social or ecological benefit—to reduce fires, clean up bug killed trees, fix watersheds, restore forest health or provide for "economic stability" to rural communities. In far too many cases, all of these are just cover to hide the main reason for logging—to maintain the local timber industry at the expense of our forest's ecological integrity and taxpayer dollars."</i> Not Peer Reviewed, Opinion. The "local timber industry" is one of only a handful of sawmills remaining in New Mexico. Because of the small diameter material being harvested, lumber is only a fraction of what is produced. In order to diversify and remain afloat, milling residue is made into compost, garden mulch,</p>	Opposing Views #1

Puerco Collaborative Forest Landscape Restoration Project
Appendix E – Response to Comments

		animal bedding and alternative energy in the form of wood pellets.	
Artley Citation	How Considered	Comment/Response	Submitted In:
Ziener, Robert R. Ph.D., "Effect of logging on subsurface pipeflow and erosion: coastal northern California, USA." Proceedings of the Chengdu Symposium, July 1992. IAHS Publication. No. 209, 1992 http://www.fs.fed.us/psw/publications/ziener/Ziener92.PDF	Not Applicable	Article is specific to coastal northern California.	Opposing Views #1